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THE DEVELOPMENT OF A COMPUTER-DIRECTED TRAINING SUBSYSTEM AND COMPUTER OPERATOR TRAINING MATERIAL FOR THE AIR FORCE PHASE II BASE LEVEL SYSTEM

30 November 1969

DEPUTY FOR COMMAND AND MANAGEMENT SYSTEMS
ELECTRONIC SYSTEMS DIVISION
AIR FORCE SYSTEMS COMMAND
UNITED STATES AIR FORCE
L. G. Hanscom Field, Bedford, Massachusetts 01730

This document has been approved for public release and sale; its distribution is unlimited.

(Prepared under Contract Nos. F19628-67-C-0427 and F19628-68-C-0399 by System Development Corporation, Santa Monica, California 90406.)

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FOREWORD

One of the goals of Air Force Electronic Systems Division is the development of a technology for automated training subsystems which could be built into future Air Force information systems. Task 691709, Automated Training for EDP Personnel, under Project 6917, Command Management Data Systems Software, was established to develop that technology and apply it in experimental computer-directed training subsystems in Air Force computer-based information systems.

This final report describes one such subsystem which was developed for use in the Air Force Phase II Base Level System. Dr. Sylvia R. Mayer, ESMDA, served as Air Force Task Scientist for this effort which was accomplished between July 1967 and December 1969 under Project 6917.

This work was supported by Contracts F19628-C-0427 and F19628-68-C-0399 with System Development Corporation. Dr. John W. Cullen was Principal Investigator with Mr. Richard S. Cowdery, Mr. Alfred K. Butler and Mr. Lawrence Harris.

The excellent support received from all members of the Air Force Development and Test Team for this project is gratefully acknowledged. Special mention should be made of the contributions of Mrs. Esther Georgatos, Air Force Directorate of Data Automation, Mr. William Stevenson, Data System Design Center; Colonel William Breeze, Sheppard Technical Training Center, and members of his staff: Mr. Charles Pealor, TSgt Hackworth, SSgt Beaver; and Captain Warren Suzuki, Hq Air Training Command.

This technical report has been reviewed and is approved.

Sylvia R. Mayer

SYLVIA R. MAYER, PhD
Task Officer, Project 691709

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Director of Systems Design and Development
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ABSTRACT

This report describes a study concerned with the design, development and evaluation of an integrated Computer-Directed Training Subsystem (CDTS) for the Air Force Phase II Base Level System. The development and evaluation of a course to train computer operators of the Air Force Phase II Base Level System under CDTS control is also described. Detailed test results for validation of the computer operator course and Formal Qualification testing of the CDTS are presented. Conclusions and recommendations with respect to the current CDTS recommendations for additional capabilities and further implications are discussed.

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Section I

INTRODUCTION

This final report describes a two and one-half year study concerned with the designing, development and evaluation of an integrated computer-directed training subsystem (CDTS) for the Air Force Phase II Base Level System. The purpose of this training subsystem is to finish on-the-job training for data automation, staff-users and management personnel in the operation and use of the base level system.

In addition to designing, developing and evaluating the CDTS the development and evaluation of a course to train computer operators of the Air Force Phase II Base Level System operation under CDTS control is described.

The Phase II Base Level Project is an Air Force-wide effort to provide automated management systems at the base level. Equipment presently installed at base level will be replaced by Burroughs B 3500 computer systems. The B 3500 system is a modular system, featuring massive immediate access (disk) storage and remote communications terminals. Its Master Control Program is designed to facilitate on-line user interaction with programs from the remote terminals.

The CDTS functions as other subsystems of the Phase II System. It conforms to the standards and requirements of the Phase II System, without disrupting normal system operations.

The application of the CDTS may vary with users of the Phase II Base Level System. The program as developed is a multi-purpose, user-oriented, interactive, subsystem which permits the construction and presentation of new lesson material or modifications to existing material without requiring programming changes.

Lessons may be designed and constructed to satisfy a variety of training requirements (e.g., initial training in a specific specialty, upgrade training, or proficiency training). The program presents the requested lesson at a remote communication terminal for individual on-line training sessions. When appropriate, computer material is augmented with off-line exhibits and instructional material.

Although the program has been designed to be compatible with other Phase II Base Level System applications, CDTS was initially used to construct and validate a computer operator's course. Students at the Sheppard Technical Training Center were used as subjects during validation.

Contents of this report.

Part II of this report describes: (1) the Burroughs B 3500 system in which the CDTS operates, (2) CDTS itself, and (3) the Computer Operator's Course.

Part III discusses the testing and evaluation phase of the study conducted at Sheppard Technical Training Center (STTC) Texas.

Part IV contains conclusions and recommendations regarding the future development and application of the CDTS.

Part V indicates the personnel who have been involved with the project.

Part VI indicates project related documentation.

Appendices:

A - Flow Diagram of the CDTS.

B - Computer Operator's Course Outline, Objectives and a sample of course material from both the course designer and trainee standpoint.

C - Phase I and II data analysis, USAF Aptitude Test Scores, and sample data collection forms.

D - Formal Qualification Testing Results

Section II

PROJECT SOFTWARE PRODUCTS: CDTS AND COMPUTER OPERATOR'S COURSE

Two software systems were developed and tested during this two and one-half year study. The first consists of a computer-assisted instruction (CAI) author language and associated computer programs. This combines to form the CDTS. The CDTS and PLANIT (Programming Language for Interactive Teaching) was used to generate the lesson material which consists of 13 lessons for training computer operators for the B 3500 system. The CDTS also was used to present the lessons to trainees via a remote terminal device. The CDTS was written in COBOL and compiled for execution in the B 3500 system to operate under the control of the Master Control Program (MCP) during its various modes.

This section describes the B 3500 system, presents a description of the CDTS and outlines the CAI lessons produced.

A. B 3500 System Characteristics

The B 3500 system as depicted in Figure 1, is a modular system, incorporating monolithic circuitry, high-speed core storage, massive immediate access (disk) storage, and remote communications terminals. It's MCP is designed to facilitate on-line user interaction with programs from the remote terminals. The following briefly describes the major components of the system.

1. Central Control. All peripheral unit operations are independent of each other and of the processor; therefore, any combination of simultaneous input-output can be overlapped with program execution. When a particular device wants a memory access, it makes an access request as soon as all requests from higher priority devices have been satisfied.

2. Core Memory. Core memory requires a memory cycle time of one microsecond for every two bytes accessed.

3. Address Memory. Address memory is an array or table of 24 words (two bytes to the word), expandable in increments of 12 words. Eight words are assigned to each I/O channel in the system. During execution, the processor addresses core memory with words from address memory so that memory accesses are not required for information relative to the command itself during execution; that is, accesses during the execution phase are for data only. A word from address memory requires an access time of only 100 nanoseconds.

4. Input/Output System. The input/output system consists of the peripheral control units and their related input/output channels and operates independently of the processor. The processor issues a command to the I/O system and then proceeds independently until

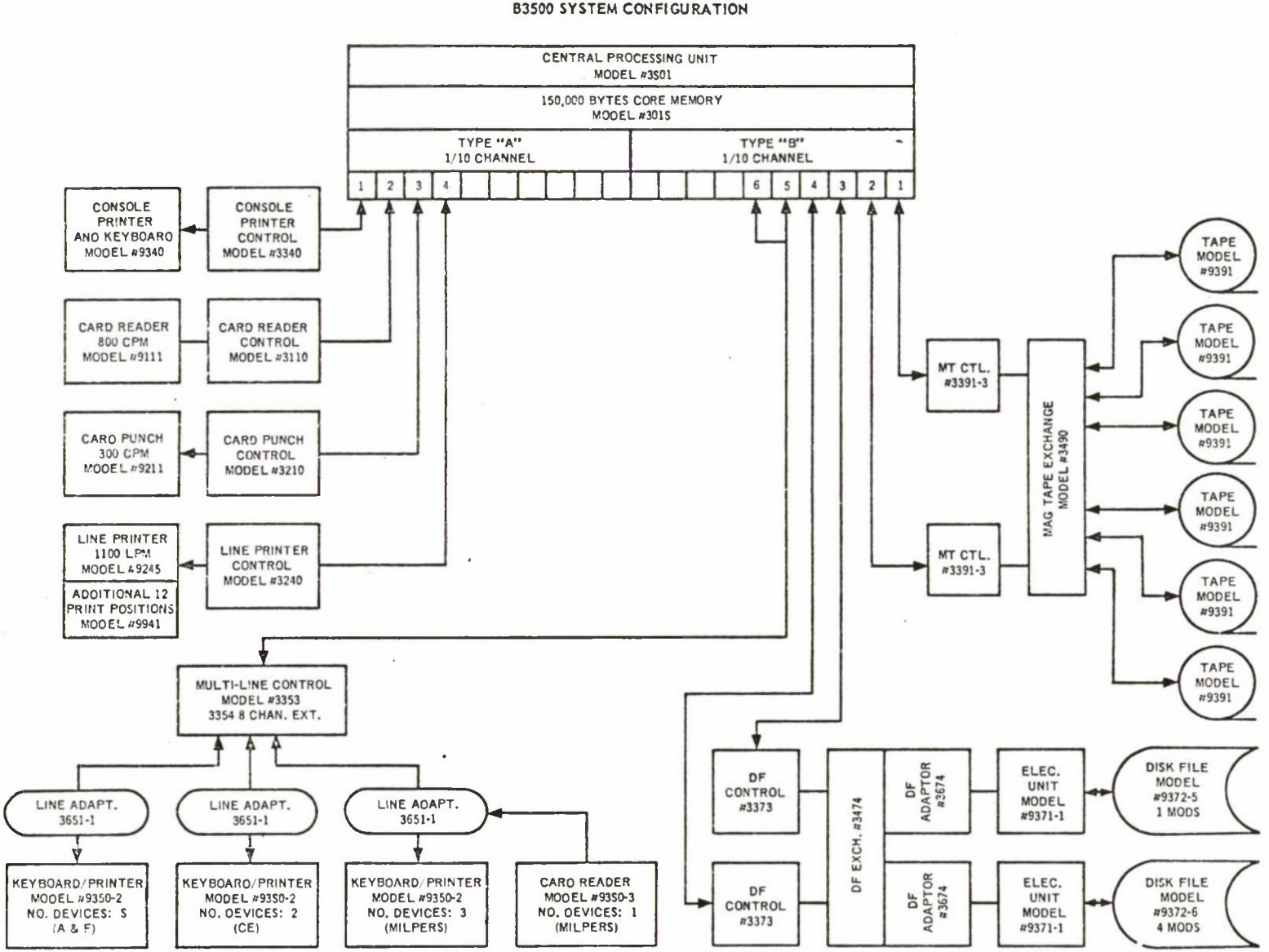

FIGURE 1 B 3500 System Configuration

the I/O system completes the operation and interrupts and any or all I/O channels may operate simultaneously. The I/O system time shares core memory and address memory with the processor, under control of the central control unit. There is an I/O channel and a peripheral control for each peripheral unit, or group of units of the same type.

5. The Processor. The processor contains the arithmetic units and the logical controls of the system. Object programs are floated in memory through use of a base register thus allowing several programs to be resident in memory at one time. The MCP will set the base register for one program, retrieve it, and turn control over to that program. After handling an interrupt, the MCP may reset the base register and turn control over to another program.

6. Operational States. The central processor always operates in one of two states: The Normal State, in which user programs are executed, or the Control State, in which the functions of the MCP operating system are performed. A powerful interrupt system causes the processor to enter the Control State and branch to the MCP whenever conditions such as completion of an I/O operation, memory parity error, memory address error, and clock interrupt occur. I/O operations can be initiated only when the central processor is in the Control State, and their execution is directed by the MCP.

7. Memory Protection. Base and limit registers are used to provide memory protection--an essential feature for multiprocessing. An attempt to go out of memory allocated will result in the suspension of the offending program.

8. Disk Files. The modular random storage disk modules provide the capacity of 10 or 20 million bytes each. The average access time for a module is 20 milliseconds, and the peak transfer rate is 218,000 bytes per second. Disk File Exchange units permit multichannel access of disk units.

9. Remote Terminal Communications. A multiprocessing environment is provided, under which up to ten users of the system may simultaneously interact with their programs from remote keyboard/printer terminals.

B. Description of the CDTS

The CDTS as designed permits the establishment of a CAI capability within the Phase II Base Level System.

Computer-assisted instruction (CAI) can be defined as using the capabilities of a computer to present instructional material to trainees who interact with the computer via a remote terminal device. A computer-assisted instructional system has several basic features: It is independent of the particular type of lesson; the material operates within a computer and there is continual interaction between the user at the remote communication device and the computer.

The CDTS is a general-purpose training system consisting of a user oriented language and a set of computer programs which permit course designers to construct material for a variety of training purposes. This material may be input to the system in an on-line mode from a remote terminal, or constructed from a card input to a batch processing program. Once constructed, lesson material is saved onto disk storage or tape for future presentation to trainees. Lessons stored on tape can be selectively loaded onto disk storage to fulfill specific training session requirements. Records of trainee performance are maintained by the system for data processing and analysis.

To accomplish these training objectives, the CDTS is divided into five basic components. (Refer to Figure 2 - CDTS Functional Block Diagram).

1. The Control Function:

    a. Interfaces with the B 3500 MCP and Data Communication Handler (DCH).

    b. Outputs the message "ENTER INITIAL COMMAND TO CDTS" as the first operation of the system.

    c. Interrogates all inputs from the remote communication terminals.

    d. Interprets all system commands.

    e. Establishes the user within the requested mode of lesson building or lesson execution.

    f. Maintains status of each user within a given lesson enabling several users to interact simultaneously with one or more lessons. Also, it allows one user to switch from executing one lesson to executing a different lesson and back to the first lesson.

2. The Lesson Building Mode:

    a. Permits a real-time construction of selected lesson material by a course designer familiar with the training system language and special conventions contained therein. The course designer can commence to build a lesson or retrieve an existing lesson and continue to insert content material. Selected material is

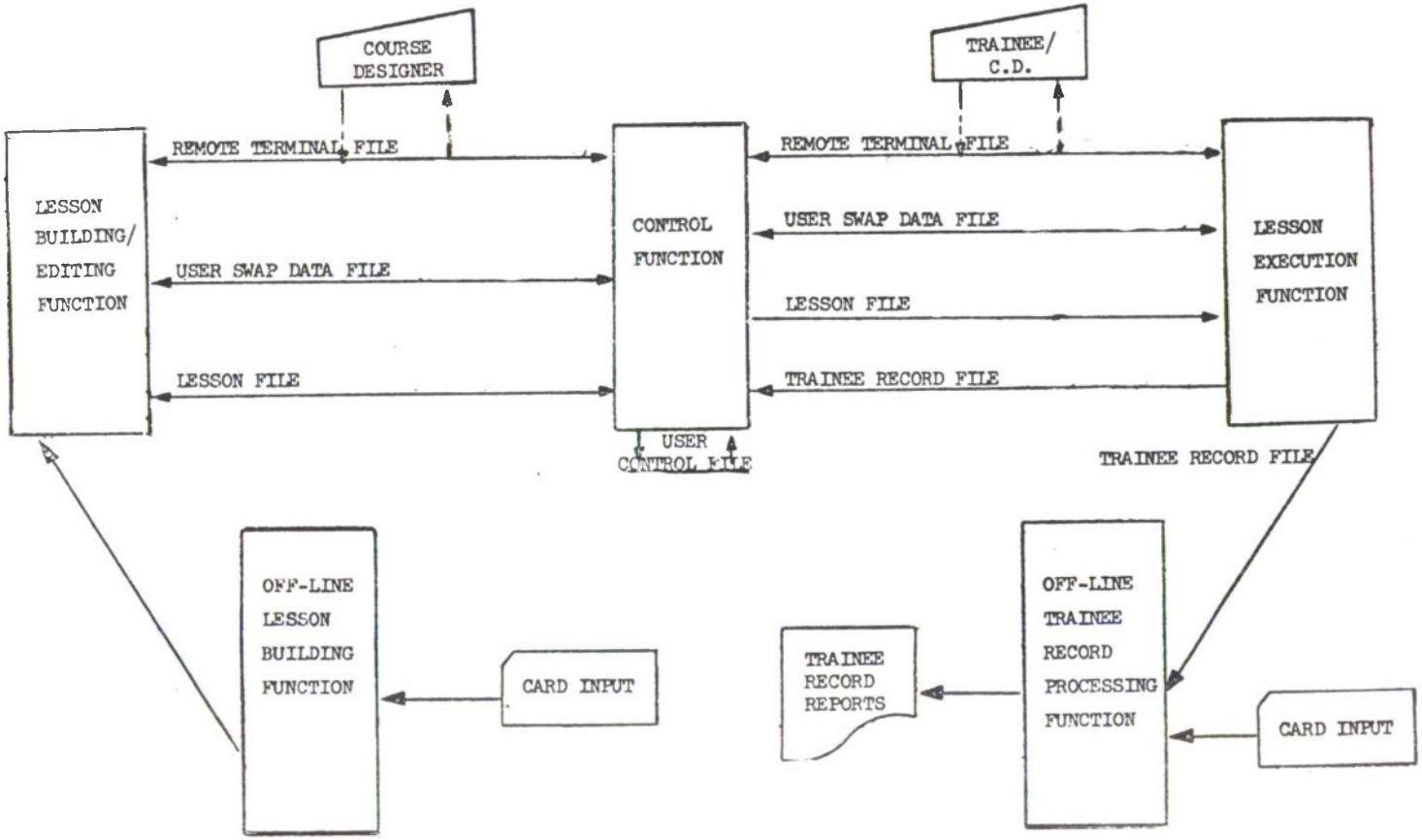

FIGURE 2 CDTS Functional Block Diagram

inserted and processed by the training program as "frame" units. Each frame is further segmented into groups and these groups are composed of individual lines of information. A lesson is therefore, a series of frames sequenced as designed by the course designer.

A sequence of related lessons can be used to form a course. There is no system limit upon the number of lessons that may be used to comprise a given course.

A lesson may be used within more than one course, when appropriate. For example: a lesson on number systems might be included in a general programming course as well as in a course dealing with an introduction to mathematical theory. The course designer has the responsibility of linking together the lessons within his course by either branching the trainee to the next lesson in the course sequence, or by providing the trainee with the information necessary for him to enter the next lesson.

b. Provides frame type selection by the course designer to meet the varying needs of course construction. The frame types available for selection are the:

   1) Question frame--normally used to present lesson content material to inform or require a constructed response.

   2) Multiple-choice--normally used to present lesson content material and alternate answer-choices for selection.

   3) Decision frame--normally used to establish conditional statements which are executed depending upon a response to one or more frames.

   4) Copy frame--a lesson building aid rather than a different frame type which instructs the program to copy any previously built frame.

   Each selected frame is automatically numbered sequentially by the program.

c. Provides on-line assistance to the course designer after the selection of a frame type. The assistance is in the form of output messages which inform the course designer of the type of information to enter within each group of the frame, (e.g., label frame, insert textual material, specify answers, and actions to institute based upon the processed response).

d. Provides a facility for on-line checkout and quality control of constructed material by the course designer. The course designer may enter the Lesson Execution Mode from the Lesson Building Mode and have his completed lesson material presented as though he were in a training status. A record is maintained of his responses and sequence through the lesson frames. In this role, the course designer performs quality control on the lesson logic and material presentation. Full training system privileges are available to the course designer in this mode, whereas, a trainee is confined to the parameters of the lesson.

e. Enables the course designer to preserve completed lesson material onto the disk. The program requires an identification from the course designer. If the identification is legal, the program associates the identification with the lesson affording a measure of protection against unauthorized changes or uses.

f. Permits the linking of two or more lessons to form a course of instruction.

g. Modification of lesson material.

1) Permits the on-line printout of selected lesson material by the course designer for visual quality control. To avoid system degradation due to excessive Input/Output operations, only a range of three frames per request is printed on-line. However, the entire lesson can be printed off-line.

2) Enables the on-line modification of lesson material by the course designer.

- o Insertion--the training system determines the level of insertion desired; frames, group or line, and whether the insertion is to occur within existing material or be added to the lesson material. If a single line is specified, the program prints out the requested line for easy reference and changes are entered. The new line of information replaces the old line in the lesson.

- o Deletion--the training system determines the level of deletion desired; frames, groups within frames or lines within groups and removes the material from the lesson.

3. The Lesson Execution Mode:

   a. Permits the retrieval of a lesson by the course designer or trainee. The program requires an insertion identification which is compared against the identification associated with the lesson. The results of the identification comparison dictate whether the program treats the user as a course designer with full program capabilities or a trainee confined to the parameters of the lesson.

      When the user is a trainee, the program positions the lesson to the proper frame depending upon whether the trainee is starting or continuing the lesson. The course designer can execute the lesson from any legal frame and has complete freedom to traverse the frames within the lesson.

   b. Allows the trainee control over the presentation rate of lesson material, subject to the constraints of the MCP/DCH and the course designer's intent.

   c. Contains service functions (PHONETIC comparison, KEYWORD match, or ORDER permutation) for evaluating inserted answers which depart from anticipated responses as programmed by the course designer. These service functions operate at the course designer's discretion.

      1) PHONETIC--causes all words in both the course designer's answer(s) and the trainee's response(s) to be encoded by the training program and the encoded messages compared for a possible match. This permits the misspelling of words by the trainee. If a misspelled word is within the encoding criteria, the response is considered correct by the program.

      2) KEYWORD--causes the program to disregard everything in the trainee's response except that which the course designer has specified to be matched. Extraneous information may be included as part of the response without penalty. When this service function is inoperative, the program makes a character set by character set (word by word) comparison to determine if the trainee's response matches the course designer's answer. No extraneous words may appear in the trainee's response for a match to occur.

      3) ORDER--causes the program to ensure that the word(s) specified by the course designer appear somewhere in the trainee's constructed response--independent of order. When this service function is inoperative, the program treats the trainee's response as a standard English statement. The words in the response must be in the same order as specified by the course designer.

d. Performs automatic evaluation of trainee responses. Inserted answers and lesson specified answers are evaluated for possible matches.

e. Outputs immediate feedback to the trainee at the end of his response. Based upon the answer matching process the program selects the appropriate type of feedback/action.

   1) Feedback--enables the course designer to specify appropriate messages based upon trainee response. If no message is specified, the program randomly chooses one from a table containing positive and negative comments. After printing the message, the program branches to the next frame in sequence or follows a subsequent command.

   2) Repeat--permits the course designer to specify a feedback message requiring another response. If none is specified, the program prints "WRONG TRY AGAIN" and waits for another response.

   3) Correct--instructs the program to print "THE CORRECT ANSWER IS" followed by the answer indicated as correct by the course designer.

   4) Branch--permits the interruption in course sequence. The program can be instructed to branch to another frame or a different lesson.

f. Detects illegal actions by the trainee and initiates appropriate recovery cycles.

g. Dynamically sequences the lesson material as a result of trainee responses and the design of the lesson.

h. Permits the continuation of a lesson at an appropriate entry point after a lesson session interruption.

i. On-line establishment and maintenance of trainee performance records. The program updates the trainee's record after presenting each frame and evaluating the inserted response. The program preserves the trainee's record upon completion of the lesson or when the command to terminate the training session is inserted. The trainee can discontinue a training session and continue from the proper point in the lesson at a subsequent session.

4. The Trainee Record Processing Mode:

   a. Stores specific data items. The program stores historical records of the trainee's path and answers through the lesson within the trainee record file.

   b. Off-line processing of individual trainee records.

   c. Off-line printout of stored information in the format prescribed--history (the sequence the trainee took through the lesson) and/or summary data for individual trainees.

5. The Off-Line Lesson Building Mode:

   a. Processes a keypunched deck containing lesson material in a prescribed format.

   b. Examines the lesson deck for format errors.

   c. Constructs the lesson onto disk storage, replacing any other version of the lesson.

   d. Outputs a listing of the lesson contents, along with notations of any detected errors.

6. The Selective Library Capability

   a. Permits the building of lessons from card input into one or more "library" tapes.

   b. Permits the selection of lessons from one or more library tapes to be loaded onto disk storage for use during a training session.

   c. Minimizes disk storage requirements needed for a specific training session by constructing a new lesson file. Lessons stored on disk from previous training sessions and not included within the current lesson file are removed, thereby releasing disk storage for additional uses.

C. Computer Operator's Course

1. Course Development

The computer operator's training material can be segmented logically into two major areas:

- o General computer programming information which is non-machine specific but considered appropriate foundation material for a computer operator.

- o Specific information which is considered necessary for a person to develop the skills to properly operate a B 3500 computer.

The development of this course material was in programmed instructional format which was then converted into a computerized format for use within the Phase II system. This required several steps. The general computer programming information was prepared first. This consisted of the instructional programmers interacting with the subject matter experts to formulate the overall course outline for lessons 1 through 8. From this outline, the creation of terminal behavioral objectives and criterion tests items were prepared. This material was reviewed by appropriate Air Force Agencies and modifications and alterations were made as required. Actual frame construction for these lessons was then instituted. This process was repeated for the B 3500 specific information and comprised lessons 9 through 13. (Appendix II contains the complete course outline and objectives).

These 13 lessons were then converted, entered and logically verified on the System Development Corporation's AN/FSQ-32V computer via the computer assisted instructional language, PLANIT (Programming LANguage for Interactive Teaching).

PLANIT is also a general-purpose computerized system which operates in four basic modes: Lesson building, Editing, Execution and Calculation. PLANIT allows the course designer to enter course content into the computer, via a teletypewriter and to store the material in designated sequences. The course designer may use a variety of lesson frame formats and review, edit, and revise the course material as necessary.

Only those capabilities in PLANIT which were compatible with the execution mode of the CDTS were used in the conversion of the Computer Operator's Course. Each lesson was entered on-line via a teletypewriter linked to the AN/FSQ-32V. The lessons were sequentially connected by the course designer in conformance

with the lesson material specifications. The output of the PLANIT-constructed lesson material was decks of cards with each card corresponding to a line of lesson input. These card decks served as input to the Off-line Lesson Building Function of the CDTS and were then available for execution on-line via the Execution Mode of the CDTS.

2. Course Description

a. General

Lesson 1 through 8 serve as material to orient the trainee to the information and concepts in the area of general programming and can be used apart from any specific computer system or complex. In contrast, lessons 9 through 13 present information concepts relating specifically to the Burroughs B 3500 computer system.

b. Specific

Lesson 1 - Introduction to Computer Concepts

This lesson is designed to present to the trainee the basics upon which he begins to build his data processing knowledge. Several data processing terms (data base, program, hardware, software, etc.) and abbreviations (DP, EDPM(E), EAM, etc.) are presented. A historical overview, computer classifications and the three generation types of computers are indicated.

Lesson 2 - Number Systems

In this lesson the trainee is exposed to the following number systems: Binary, Octal, Decimal, and Hexadecimal. The concepts of expansion, complimentation, as well as addition and subtraction for the above number systems are presented. Conversions are made from one system to another regardless of the system. Definition of terms within this lesson include bits, triads, and quadrads, etc. Primary emphasis of instruction within this lesson is directed toward the hexadecimal number system.

Lesson 3 - Basic Computer Components

The trainee is given the descriptions and relationships between the following computer components: storage, arithmetic unit, control and I/O units. Terms introduced within this lesson include registers, word locations, memory buffering, parity, bytes, etc. The cycles of a computer (machine, instruction and execution) are covered in detail.

Lesson 4 - Computer System and Peripheral Units

This lesson presents the types of storage devices associated with a computer system. This includes punched cards, magnetic tape, paper tape, drums and disks. The criteria is given for evaluating these various storage devices as to capacity, speed, reliability, cost, power requirement and physical size. Input/output configurations are noted along with the types of access. The remaining material covers various aspects of computer timing.

Lesson 5 - Data Representation

The trainee is provided explanations and exercises concerning the use of such terms as binary, BCD, EBCDIC, bytes, print images, etc. In addition, the representation of fractional numbers (fixed versus floating) is presented.

Lesson 6 - Program Design

This lesson indicates the various components which interact and their function in the establishment of a system. The use of the flow chart within a program design is emphasized. This includes the types of flow charts (micro versus macro), when used and by whom, flow conversions (e.g., branch, halts, etc.) and the standardized symbols employed. The decision table and other related methods are also presented to the trainee.

Lesson 7 - Programming Languages

This lesson presents to the trainee the concepts and uses of assemblers, translators, compilers, etc. Explanations include the advantages and disadvantages of MOL, Symbolic code and POL's. Generalized coverage of the instructional classes (arithmetic, sequence control, data movement, comparison, I/O) are presented. The trainee is also provided a cursory review of several of the more established and widely used POL's with special emphasis directed toward FORTRAN and COBOL.

Lesson 8 - Operating Systems

The trainee is exposed to the purpose and general description of several types of operating systems. The examination of time-sharing (advantages and

disadvantages) and the related terms of real-time, batch processing, turnaround, supervisory time, job-shop, etc. are considered. Also, the two basic modes of operation (background versus foreground) is presented to the trainee.

Lesson 9 - Introduction to the B 3500 System

This lesson provides the trainee with basic precepts and configuration of the B 3500 system. An introduction to the types of hardware which comprise the system and the general functions performed by the operating system, is outlined. In addition, a brief description of the core memory and word configuration, internal processing capabilities, data presentation selectable codes, and the on-line operating consoles are presented.

Lesson 10- Peripheral Equipment--Low Data Rate

The card reader, punch, and line printer are presented in detail to the trainee. The user logic for the operation of these three pieces of equipment is presented along with a description of all control panel switch/indicators. At appropriate stopping points within this lesson the trainee is directed to perform "hands on" training and demonstrate a level of mastery with each unit. This includes operating the card reader and punch by inserting a test deck, and recovering from several error conditions.

Lesson 11- Peripheral Equipment--High Data Rate

This lesson considers in detail the tape units and disk units/modules associated with the B 3500 system. Step by step user actions are presented for various tape unit actions. The rationale of disk storage and use is given in addition to the various types of disk construction. As in lesson 10, the trainee is required to perform "hands on" training and demonstrate a prescribed level of mastery by loading a tape and correcting various error conditions.

Lesson 12- Operators Console and Supervisory Printer/Keyboard

This lesson introduces the trainee to the equipment by which direct interaction with the operating system and all other on-line systems is effected. All button actions and operating procedures are given for the SPO, operators console, as well as the control panel.

The step by step procedures for loading the operating system either by the Normal or Universal load along with the conditions which differentiate each type of load are detailed.

Lesson 13- System Software and Intervention

This lesson was divided into two parts. In Part I the trainee is exposed to several definitions and concepts which are pertinent to B 3500 system operation. This includes scratch tape, system log, file opening, disk directory table, and break-out. The remainder of the material addresses itself to the system load procedures (simple versus cold start) with particular emphasis upon the card structure for each type of system load.

The various kinds of program and parameter control card are discussed as to their function and when required within a specific system load control deck. The type of system start required because of the particular status of the system or to effect a particular condition is also presented.

In Part II, the trainee is exposed to the three major categories of output messages (errors, requirements and results to input queries) generated by the operating system. This is followed by indicating the techniques and procedures of introducing data and program files into the system. Here the emphasis is upon the source and type of data (card and pseudo card decks, and SPO input messages) and the scheduling and operation of programs within the schedule versus the mix. Next, the capabilities provided to an operator to interact and control the system operation are considered. This includes the type and procedures for inserting control information, enabling or disabling system options, performing maintenance of the system log, interrupting and restarting as well as suspending and reinstating operating programs. The remainder of the material considers program failure and debugging.

3. Lesson Strategy

The basic strategy as indicated in Figure 3 is the same for all lessons. The student is permitted the option of taking the lesson material or attempt to by-pass the material contained within the

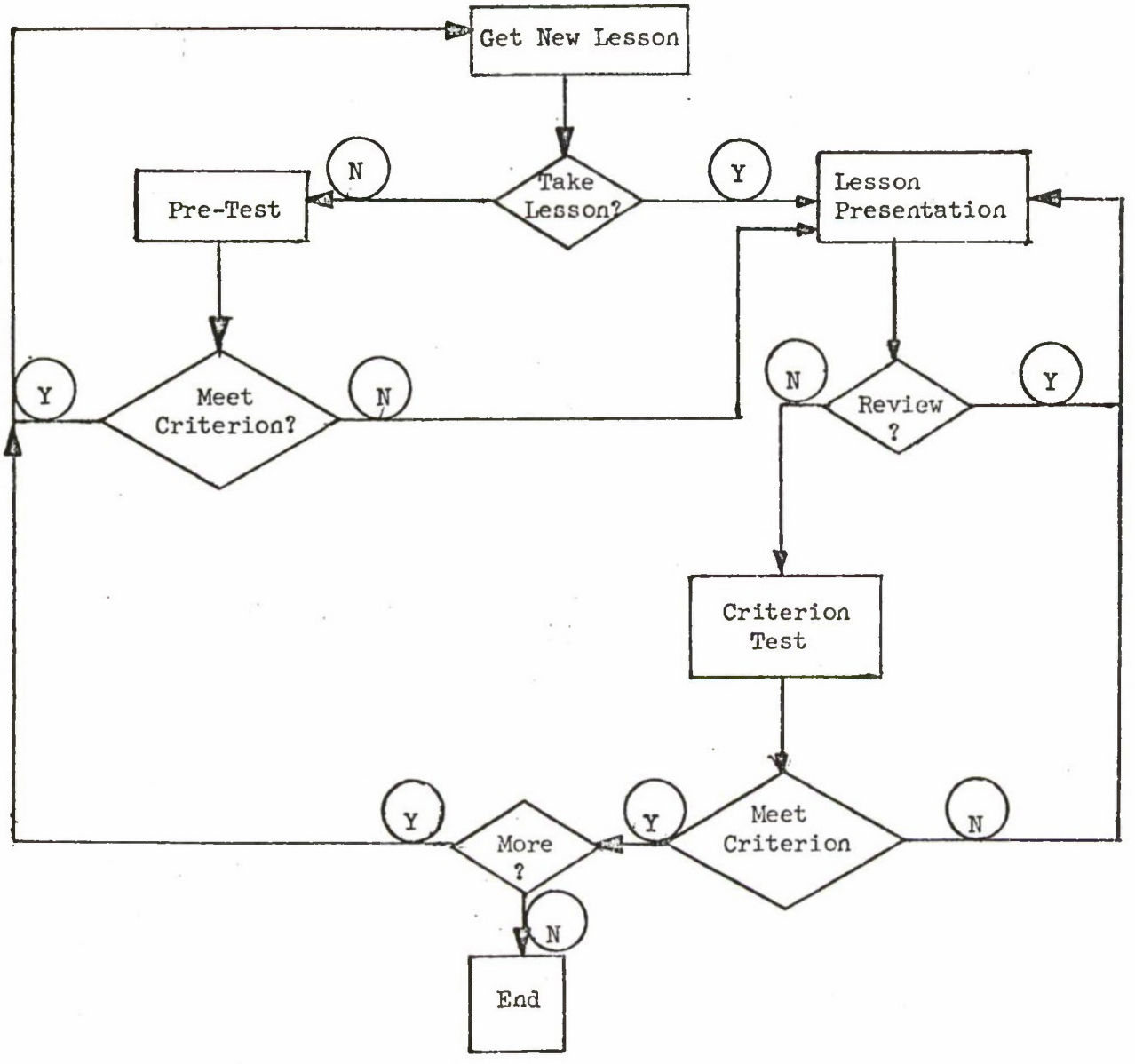

FIGURE 3 Lesson Logic for the Computer Operator's Course

specific lesson by successfully negociating a prerequisite test. The prerequisite test is lesson specific and is not a criterion test which is contained at the end of each lesson.

At selected points within the prerequisite test, it is determined through decision statements the trainee's position within a pass/fail criterion. Tolerable errors approximate 10% for each lesson. If the condition is--PASS, as determined by his correct responses to the test items, the trainee proceeds to the next subset of the prerequisite test. However, if the condition is--FAIL, as indicated by errors exceeding the prescribed criteria, the trainee is unconditionally branched to the starting point in the lesson material.

If the trainee demonstrates mastery of the material contained within the lesson by successfully passing the prerequisite test, he is branched to the next lesson within the computer operator's course.

At the completion of the lesson material the trainee may review all or selected parts. He will then be exposed to the criterion test for that lesson.

If the trainee fails to meet the lesson standards, he is automatically branched to appropriate review material. Upon completion of this material the trainee is returned to the departing point in the criterion test.

The trainee must demonstrate mastery over these test items before he is allowed to advance to the next lesson within the computer operator's course.

SECTION III

TESTING AND EVALUATION

The production of the two software products: The CDTS and the Computer Operator's Course required that two distinct testing operations be conducted at the Sheppard Technical Training Center (STTC), Sheppard Air Force Base. For each software product a test plan was prepared which established the general and specific requirements and set forth the necessary procedures to effect the accomplishment of the particular test.* A description of the Computer Operator's Course validation effort and results will be presented followed by the Formal Qualification Testing of the CDTS with the results of that effort.

A. Validation of the Computer Operator's Course

The validation of the Computer Operator's Course was conducted at the Sheppard Technical Training Center using the operational Burroughs B 3500 computer system and the CDTS.

The usual three phase validation sequence (i.e., individual, small group, and field testing) was reduced to a two phase sequence (designated Phase I and II) to facilitate validation within the allocated time period. Phase I and II were accomplished during the time periods of 4-24 March and 28 April through 19 May 1969 respectively.

1. Test Conduct

a. Phase 1

Phase 1 combined the traditional individual and small group validation techniques and was termed: GIVE (Group - Individual Validation Environment).

Six (6) Air Force trainees and two validators who were assisted by two Air Force personnel serving in the capacity as monitors comprised the manpower for the Phase I validation. The trainees were divided into 2 teams of 3 men each and were observed by one validator/monitor team.

Eight (8) Frieden Remote Terminals were available for use to present the lesson material to the trainees and permit the entering of answers on-line for processing by the Execution Mode of the CDTS. These Remote Terminals were situated in two separate locations with one terminal serving as a backup in the event of any malfunction as indicated in Figure 4.

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* See project documentation for appropriate references.

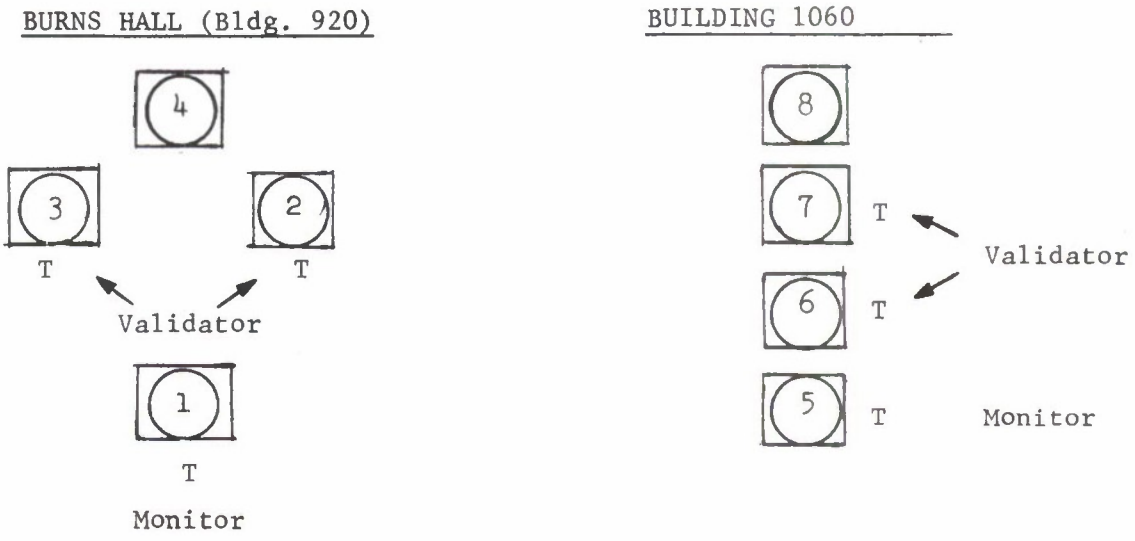

FIGURE 4 Remote Terminal Configuration and Numeric Designation.

As indicated in Figure 4, the monitor directed all of his attention toward a specific trainee whereas the validator attempted to monitor one of the two remaining trainees. The third trainee was monitored by the validator on an-as-needed basis. To gain rapport, and reduce possible bias, the validator and monitor systematically rotated among the three trainees for each computer session. In addition, the trainees made by-weekly intra-and inter-building positional rotations.

Prior to the initial on-line administration of the lesson material, the six Air Force trainees were briefed by contractor and appropriate Air Force personnel as to the nature of their task, schedule of activities and the attendant procedures. Lesson material was then selected for presention by the execution mode of the CDTS in accordance with the schedule as set forth in the test plan.

Access to B 3500 hardware (e.g., Supervisory Keyboard/Printer, Tape Units, Card Punch, etc.) was necessary to complement the material contained within lesson 9 through 13.

During the individual phase of the self-paced GIVE technique, the validator/monitor teams recorded not only all areas of difficulty (both observed and stated) within the lesson material but also noted all overt mannerisms which provided the stimulus for further exploration.

Within the small group phase of the GIVE technique the trainees were instructed to record on the forms provided pertinent comments regarding the lesson material.* The validator/monitors were available to reslove these areas or questions deemed crucial by the trainees. This limited amount of activity did not appear to curtail the effectiveness of the validator/monitor with the trainees during a specific computer session.

Upon culmination of each daily session, (Mon-Fri - 1800-2300 hours and Sat-Sun - 0800-1130 hours), all trainees and validator/monitor teams met for a one hour critique session. During these critique sessions additional comments and suggestions were elicited from the trainees concerning problem areas as well as suggestions for additions and/or deletions to the lesson material. Based upon the information gathered during the on-line computer sessions as well as from the critiques, the validators performed appropriate on-line editing of the lesson material.

b. Phase II

Phase II was a field test conducted by Air Force personnel with assistance from contractor personnel. The environment was structured to simulate a quasi-classroom setting. As in Phase I, personnel were selected to serve as permanent monitors for the entire validation activity. Additional Air Force personnel were scheduled to augment this permanent team and were rotated on a weekly basis. Contractor personnel involved in the Phase I validation also participated in Phase II.

Twelve (12) Air Force trainees were selected to participate in the Phase II validation activity.

The 8 Frieden Remote Terminals used as trainee devices in Phase I remained in the same location initially and retained their relative number. On 14 May, remote terminal #4 was moved to another room and redesignated #2. Remote terminals #2 and #3 were redesignated #3 and #4 respectively.

As in Phase I, the trainees were briefed by Air Force personnel as to the nature of their task, schedule of activities and the attended procedures. The major emphasis in Phase II was that the trainees should work unassisted at the remote terminals without intervention by Air Force or contractor personnel. When required, trainees were assisted by Air Force or Contractor personnel when system or subsystem malfunction interrupted normal trainee progressions through lessons.

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* See Appendix III Table 13 and 14 for examples of the forms provided to the trainees.

Each trainee for Phase II was given a number for identification purposes and rotated among the remote terminals according to the master schedule as indicated on the following page.

Total time allocated for each trainee per night was four hours. Each trainee remained at a particular remote terminal for an hour and then either moved to another remote terminal or went on a forced break for an hour.

Maximum time allocated for lesson execution before a forced break occurred was two hours. The trainee had to execute the second hour of a two hour block of lesson execution time at a different terminal.

The monitors for this phase remained at specific terminals for the entire nightly session. No rotating of monitors during Phase II was required. The trainees did however, rotate between Burns Hall (Bldg. 920) and Building 1060 on a daily basis. The daily schedule was Mon-Fri - 1800-2400 hrs. and Saturday - 0800-1200 hrs.

TERMINALS

	HOURS / TRAINEE IDS	1	2	3	4	5	6	7	8
Day 1	1	1	3	4	5	7	8	9	10
	2	2	6	1	3	11	12	7	8
	3	4	5	2	6	9	10	11	12
	4	5	4	3	1	10	9	8	7
	5	3	1	6	2	8	7	12	11
	6	6	2	5	4	12	11	10	9
Day 2	1	7	8	9	12	1	3	4	5
	2	11	12	7	8	2	6	1	3
	3	9	10	11	12	4	5	2	6
	4	10	9	8	7	5	4	3	1
	5	8	7	12	11	3	1	6	2
	6	12	11	10	9	6	2	5	4

As each trainee executed a particular lesson, he recorded certain categories of information and comments on the forms provided. Upon completion of a specific lesson, the trainee completed the lesson attitude form. These forms along with a hard copy of the lesson as output at the remote terminal as well as trainee records processed off-line at the completion of each computer session were collected by the contractor. In addition, each monitor recorded certain categories of data and made comments concerning system operation and efficiency, hardware experiences and trainee problems or comments. All of these data were used by the contractor to perform a detailed frame analysis of the lesson material.* Based upon this analysis, appropriate modifications were made to the lesson material. No formal critique sessions were conducted during this validation phase although informal critiques did occur between the trainees and monitors.

2. Test Results

Emphasis during Phase I was primarily focused upon:

- Modifying the material to eliminate inconsistencies, remove difficult and/or ambiguous areas of instructional material and to incorporate pertinent suggestions/comments received from the trainees and monitors.

- Determining the average length of time for trainees to execute each lesson. System down time caused by hardware, program errors, and lost time due to illegal/illogical course execution was to be factored out from on-line course execution time.

During Phase II primary emphasis was focused upon the teachability of the lesson material as measured by the success or failure to pass the criterion items associated with each lesson.

Analysis of the data gathered indicated that the Phase I trainees required an average of 45 hours to execute all the lessons. When breaks and remote terminal down time is included, the average time to execute the course increases to approximately 60 hours. The range including these latter factors (breaks and remote terminal downtime) was 50 to 70 plus hours.**

Because of the rotation of the trainees among the remote terminals in the Phase II, complete data concerning the length of time to execute individual lessons in a simulated classroon environment was not collected. However, it is felt that the above times are meaningful in that as far as possible all time parameters not related to actual on-line execution were factored out.

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* See Appendix III, Table 11 for an example of this frame analysis process.

** See Appendix III for the detailed analysis of data collected from Phase I and II.

The allocation of time expended can be compared between Phase I and Phase II. As Table 1 indicates, the effective time (i.e., actual on-line execution) for Phase I was 56.4%. This is contrasted with a 69.9% effective time during the Phase II validation activity. There are several reasons for this 13.3 increase. During Phase I, all components of the validation activity were being "shaken down" for the first time in a heavy workload environment. This included the B 3500 system software and hardware, the CDTS (formal qualification testing had not yet been perfomed), and the course material. The operational efficiency and reliability of all of these components had increased by the time Phase II was conducted. This is evident when time lost due to various software/hardware malfunctions between Phase I (14.0%) and Phase II (9.7%) are compared. Also, during Phase I the CDTS required several recompilations (8.6% of the allocated on-line time) to correct known errors or improve operating efficiency. This activity was not required during the Phase II validation activity.

A factor which tends to distort the computation of the effective time was the inability to "start" the computer training sessions as scheduled. This was normally due to the overlapping of computer operations from the previous shift into the time allocated for the computer training sessions. The "time lost" was treated as any other factor which reduced the trainee's scheduled time for lesson execution. If this factor is removed from the analysis, the effective time would be 66.3% and 78.9% for Phase I and II respectively.

TABLE 1 Time Allocation--Phase I and II Validation Activity

	Phases I	Phases II
1. Effective time	56.4%	69.9%
2. Non effective time	43.6%	30.1%
Malfunctions (OS, DISK, DCH, etc.)	14.0%	9.7%
Computer Operations End of day processing, Driver routine	9.9%	8.8%
Remote Terminal Downtime	7.0%	11.8
CDTS Recompilations	8.6%	----
Misc (lesson logic, wasted review)	4.1%	----
	43.6%	30.1%

The only increase in noneffective time between Phase I and Phase II was remote terminal downtime. In Phase I only six (6) remote terminals were required at any given time. This permitted a backup remote terminal to be available for use in the event a remote terminal malfunctioned. When this occurred, the trainee was moved to a backup remote terminal negating excessive loss of on-line time. This was not possible during Phase II as all remote terminals were required.

When a remote terminal malfunctioned, it resulted in a direct loss of effective time as the trainee or trainees scheduled for that particular remote terminal had no backup. The time lost had to be made up at the next scheduled time on a functioning remote terminal. If a remote terminal was nonoperational for the entire computer session, each trainee lost one (1) hour of on-line execution time.

Another area of investigation during the validation activity was response time latency. (See Figure 5) This was defined as the interval of time after a keyed response and the carriage had been returned to the leftmost position, until the next message was received at the remote terminal.

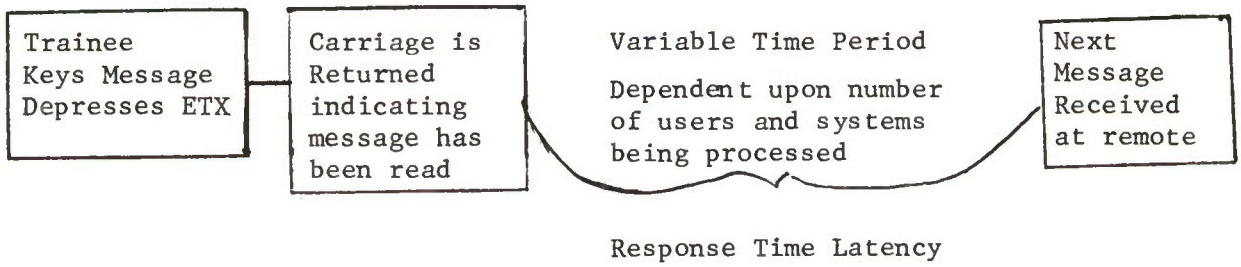

FIGURE 5 - Response Time Latency

Prior to the validation activity, no data were available as to the effect an increase in system users and/or programs would have on the processing of trainee inserted answers. Also the CDTS was specifically not designed to operate in a dedicated environment and in an operational setting most probably would not. The effect of other programs operating within the B 3500 system on the processing time of the CDTS needed to be determined.

During Phase II, the monitors were instructed to record response latencies every 30 minutes.* Also, since the CDTS was for the most part operating as the only program within the B 3500 system during the validation activity, on several occasions, one or more programs were caused to operate at the same time the CDTS was in operation.

The data collected indicated that the median response time regardless of the number of users or programs operating in a multiprocessing prioritized environment was 7 seconds.**

As expected, when the CDTS was operating within the B 3500 system with other programs the response latency did tend to increase to approximately 1Ø to 12 seconds. It also appeared that as the number of users increased the response latency increased 1 or 2 additional seconds. The damping factors to consider if stringent conclusions are attempted is the operation of the remote terminals themselves and the accuracy of the monitors in their recording efforts. At best, it appears that increases in system users causes less increase in response latency than operating additional programs within the B 3500 system. The response latencies experienced by most of the trainees seemed to be well within tolerable limits.

The overall performance of the Phase II trainees on the criterion test items was 83/85. Individual results on the lessons is contained in Appendix III Table 9. No data are included within this report from the Phase I trainees. Based upon their performance and comments, various test items as well as lesson material was modified. Comparing their overall performance with the Phase II trainees is not considered meaningful.

The criterion test items which had a frequency of three or more errors in Phase II were subjected to a detailed analysis. A sample of this item analysis and disposition is indicated in Appendix III Table 11.

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* See Appendix III Table 12 for response latencies recorded by monitor during Phase II.

** The maximum number of system users was eight and the number of additional programs was three.

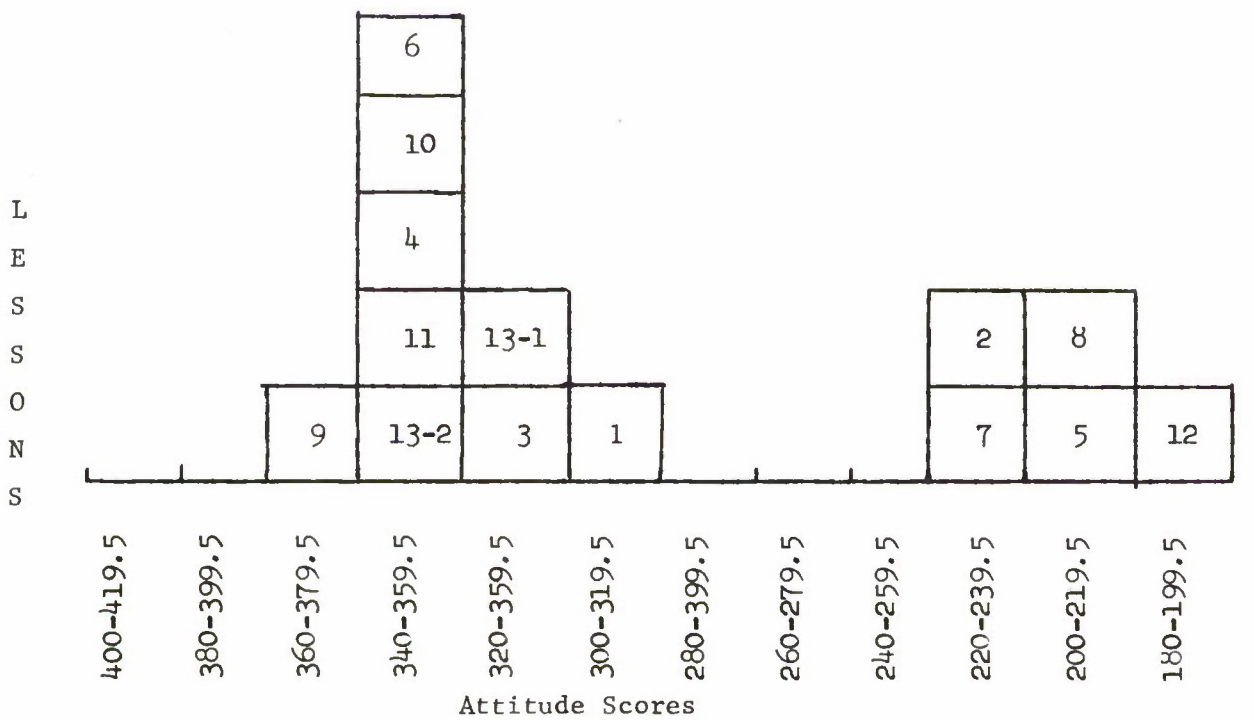
3. Attitudes

a. Toward the Lessons

The trainees for Phase I and II were required to fill out a ten item attitude form after completing each lesson. The results are indicated in Table 2 for Phase I and Table 3 for Phase II. A different weighting system was used for each Phase. The data from Phase I indicates a definite bi-modal distribution of lessons with lessons 2, 7, 8, 5 and 12 having a less favorable effect upon the Phase I trainees. After modification of the lesson material, the distribution of attitude toward the lessons by the Phase II trainees approximates a normal distribution.

Examination of the two tables indicates that lesson 9 was considered the most "popular" for both groups of trainees. Except for lesson 2, the lessons scoring lowest in Phase I basically retained their relative standing even though the overall attitude toward the lessons in Phase II was less divergent.

TABLE 2 Phase I Trainee Attitude Toward Lessons.

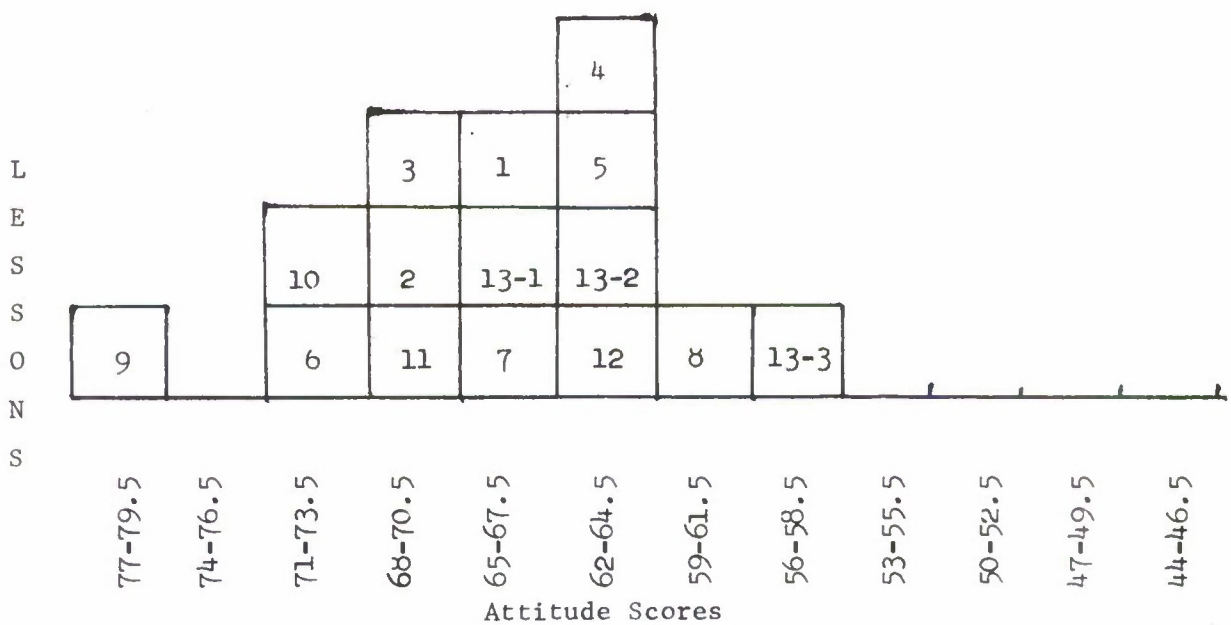


The question of whether attitude toward the lessons was affected by the performance was also considered. A scatter gram was prepared using data from Phase II (Figure 6) in which the median criterion test scores were plotted against the median scores reflecting the trainee's attitude toward each lesson. Inspection of the scatter gram does not yield conclusive evidence to indicate that the higher the performance as measured by the criterion test scores the more favorably perceived was the lesson. Lesson 8 however reflects the lowest performance score and the attitude toward this lesson was also the lowest.

Lesson 9 was considered the most favorable even though the performance on this lesson was not the highest. Of the remaining lessons, approximately 6 tended toward the direction of high performance--favorable attitude, whereas 6 other lessons tended slightly toward the direction of not quite as high a performance--less favorable attitude.

The complexity of the material was not specifically factored out in the analysis. However, the lessons in which performance was lower tended to be the more complex lessons within the course.

TABLE 3 Phase II Trainee Attitude Towards Lessons.



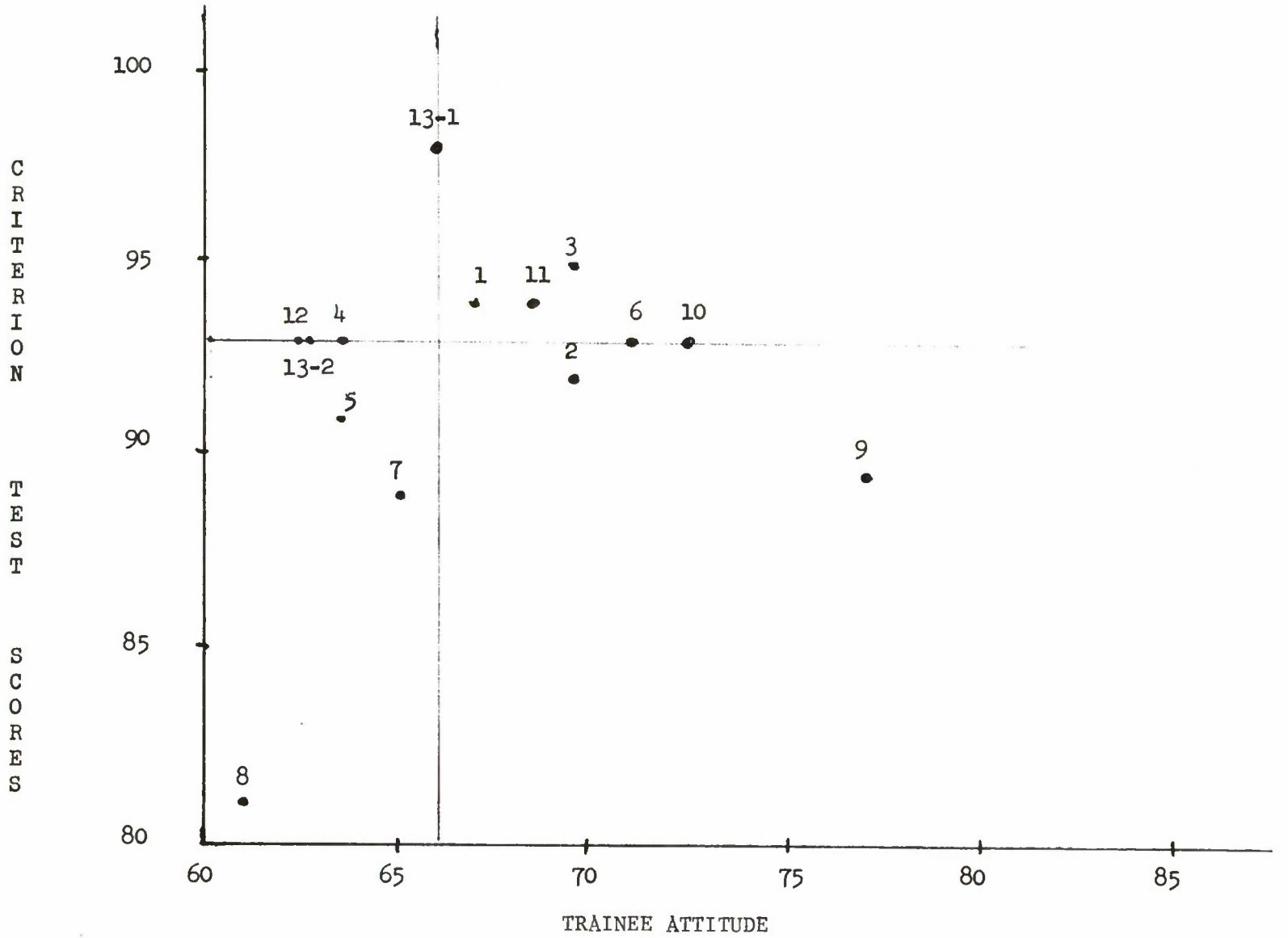


FIGURE 6 Trainee Attitude versus Criterion Test Scores--Phase II

b. Toward the physical facility*

At the completion of the validation activity the trainees were asked to consider the physical environment in which the computer assisted instruction was administrated. All of the trainees indicated that their general comfort was satisfactory and the lighting/ventilation was more than acceptable.

c. Toward the remote terminal

In general the attitude of the trainees toward the remote terminal was favorable. The trainees indicated that the operation was very easy, the material as output very easy to read and the rate of presentation for 75% of the trainees was about right. For the remaining 25% of the trainees it was felt to be too slow for their reading ability. Only one trainee felt that his typing skill was not adequate for the required tasks. All trainees except one indicated that the remote terminal was adequate for presentation of the lesson material. Sample comments from the trainees indicated that:

- Presentation too slow because of time outs and system failures.
- The noise level distracting and uncomforting.
- Reaction time was extremely slow.
- Main problem is response time - typing speed is too slow - need CRT.
- Terminal is adequate if the response is up to par and the system is in working order.
- Material typed out varied from good to bad, depending on the condition of ribbon, paper, etc.

d. Toward CAI

Trainee attitude in this area was of special interest. For the majority of the trainees this was their first exposure to computers and for all trainees their first exposure to computerized instruction.

Even discarding a novelty effect which was probably aided by some level of Hawthorne effect as the trainees knew they had been selected to participate in this Air Force funded project, the reaction to CAI by the trainees was most favorable. Eighty-three percent indicated that CAI seemed to make the material

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* Only attitudinal data collected from the Phase II trainees are presented unless noted otherwise. It was felt that the interaction required during Phase I between the validators/monitors and the trainees might have biased the data.

easier to learn and tended to increase their level of interest toward learning the material. Only one trainee felt the course was too long whereas all trainees indicated that interacting with a computer was most interesting. There was mixed feelings about the length of time at the remote terminal for a given computer session. Sixty-six percent felt the time was about right, with the remaining trainees split in their feelings between the sessions being too long or not long enough. The trainees did not feel that CAI should replace other more conventional types of instruction. Over 80% indicated that CAI should be used in a complementary role as opposed to a replacement vehicle. This was further substantiated by all of the trainees indicating that at some point in executing the lesson material they felt a need for non-computerized assistance. Representative comments from the trainees indicated:

- o PI could be learned in the same way.
- o Do not recommend CAI for replacement of other types of instruction, but should be used for presenting the majority of subject areas.
- o Repetition, although necessary, was the worst part.
- o Need more humor.
- o To teach this way is too expensive.
- o Of great advantage over the traditional student/lecturer system.
- o I could have concentrated more easily in the daytime.
- o I enjoyed the course and believe I learned a lot.

B. Formal Qualification Testing of the CDTS

Formal Qualification Testing (FQT) was conducted as part of the Category I Test Phase in accordance with section 4 of ESD-TR-68-301 and TM-(L)-3724/003/02 to verify that the CDTS operation conformed to the requirements as stated in the Part I CEI Specifications.

1. Test Concept

The basic test concept as specified in the Test Plan was followed. The production of expected outputs as a result of internal reaction to a set of inputs provided the basis for the verification of proper subsystem operation. In addition, specific inputs were made via the the test vehicles to exercise each subsystem function in a system context and a system output used to verify that the function operated properly. Exercising of each separate system function was accomplished during the preliminary qualification testing in conjunction with the

validation of the Computer Operator's Course. To accomplish this, the three basic tests as indicated in the Test Plan were developed. (DEMOØ1, DEMOØ2 and OFLINE).

2. Test Objectives

The basic objectives of each test was to verify the performance of a functional area or segment therein. It was not always possible to completely isolate a given functional area or segment, as the test input could cause the generation of an output which required the interaction of more than the specific area under test.

Also, as it was not possible to test every conceivable combination of inputs and conditions, the test was concerned with those combinations which were predicated as the most likely to occur.

3. Location and Schedule

The test was conducted at the Sheppard Technical Training Center in accordance with the schedule, as set forth in the Test Plan. The actual test required only 16-18 June 1969 to be accomplished.

4. Personnel Requirements

The Air Force Test Team was officially composed of military and civilian personnel from the following agencies:

Agency	Representatives
Hq USAF (AFADAB)	1
Hq USAF (AFADAE)	1
Hq USAF (AFPTRD)	1
Hq USAF (AFPMDC)	1
AFDSDC (DI)	1
ESD (ESLFE)	1
Hq ATC	2
STTC	2
KTTC	1
Contractor	3

Apart from the official Test Team, visitors from these as well as other agencies attended the FQT sessions.

5. Test Structure

The three basic tests--DEMOØ1, DEMOØ2 and OFLINE were developed by the contractor in advance of the test activity with the actual generation being accomplished at the STTC using the Phase II Base Level System.

The decision to construct "lesson-like" tests was based upon the varying backgrounds and knowledge of the CDTS by members of the Test Team. Knowledge ranged from considerable details of the CDTS operation gained from experience as monitors during the validation of the Computer Operator's Course to a general appreciation of the project and CDTS operation.

Rather than attempt to bring all Test Team members up to some level of expertise concerning the CDTS operation prior to the FQT, it was reasoned that the system in many instances could "demonstrate and test" itself. The tests, therefore, were designed to accomplish two basic tasks.

- Impart general as well as specific information about the CDTS, including its capabilities, basic operating instructions, restrictions and limitations.

- Fully exercise and demonstrate the on-line Execution, Building and Editing Functions (DEMOØ1 and DEMOØ2) and the off-line Lesson Building Function (OFLINE).

The general functions contained within each test which were to be demonstrated and verified were:

TEST	FUNCTION
DEMOØ1	Brief Description of CDTS
	GET Command
	CO Command
	CDTS Options
	GOTO
	QUIT
	Lesson Building
	Group 1
	Group 2
	Group 3
	Group 4
	Lesson Editing
	Insert
	Delete
	Print

DEMOØ2	SAVE Command STATUS Command RESTART Command EX Command Lesson Execution Group 1 Group 2 Q and M Group 2 D Group 3 Q and M Group 4 Q and M Keyword, Phonetic, Order Trainee Record Processing
OFLINE	Categories of legal and illegal inputs.

6. Test Materials

Each member of the test team was provided the following materials:

- o Test Plan
- o Users Manual
- o Copies of the test scenarios.
- o Listing of the tests--DEMOØ1 and DEMOØ2.

The tests, DEMOØ1 and DEMOØ2 were generated from card decks using the CDTS Off-line Lesson Building Function, stored on disk and available for use when requested.

7. Test Conduct

a. General

Two members of the Test Team were selected to serve as a "trainee" and as a "course designer" respectively. These two Test Team members conducted the portion of the test which required the use of scenarios in conjunction with the instructions contained within the test vehicles. Two remote terminals which were adjacent were selected for this activity to facilitate the inter action required during the FQT between the "trainee" and the "course designer."

Contractor personnel worked closely with these two Test Team members and this specific activity was considered to be the "official" test. The remaining Test Team members conducted the test as instructed within DEMOØ1 and DEMOØ2 as "trainees" bypassing those sections of the test requiring actions by a course designer. Many Test Team members did interact with the

CDTS as course designers but did not follow a prescribed scenario. This activity was considered to be part of the FQT but in addition to the "official" Test Plan activity.

Prior to the start of each test session, the computer operator initiated the Data Communications Handler, identified NEETØØ, the remote terminals to be accessable and entered the appropriate SPO commands to indicate that NEETØØ was to be started.

b. Specific

1) Day 1

At the start of the first session, DEMOØ1 was requested by the "trainee" and the FQT officially commenced. The "trainee" followed the instructions contained within the test vehicle itself. At appropriate points the "course designer" was instructed to follow a specific scenario or initiate an action(s) at his remote terminal.

The "trainee" and "course designer" used the listings of test vehicle to follow as well as verify that the test was proceeding as planned and the CDTS was functioning as specified.

Functions demonstrated and verified included:

- o GET Command
- o CO Command
- o CDTS Option - GOTO

Trainee records for all participating Test Team members were generated at the completion of the test session.

2) Day 2

DEMOØ1 was again requested by the "trainee" and the FQT continued.

Functions demonstrated and verified included:

- o CDTS Option - Quit
- o Lesson Building
- o Lesson Editing - Computer Operator's Course Lesson 6 was the test vehicle.

Trainee records for all participating Test Team members were generated at the completion of the test session.

3) Day 3

DEMOØ2 was requested by the "trainee" and the FQT continued.

Functions demonstrated and verified included:

- o SAVE Command
- o STATUS Command
- o RESTART Command
- o EX Command
- o Lesson Execution
- o Service Functions

At the completion of DEMOØ2, the on-line FQT was completed. The FQT of the off-line Lesson Building Function was demonstrated and verified by the test--OFLINE.

The CDTS generated OFLINE from a card deck indicating the various errors and discrepancies as contained therein. The card deck was corrected by a Test Team member following the scenario provided and OFLINE regenerated as an "error free" lesson.

Trainee records for all participating Test Team members were generated at the completion of the test session.

8. Test Results

The off-line listing of the tests--DEMOØ1 and DEMOØ2 were used during the conduct of the FQT to ensure that the tests functioned as designed. One discrepancy, the incorrect printing of an item value, was detected and corrected prior to the end of the FQT.

The CDTS also allowed a non-course designer to obtain a lesson using the command, #get L-----, which permitted undesirable access to a lesson. The use of this form of the "get" command has since been restricted to use by course designers and appropriate documentation issued.

Finally, the implementation of the initial lesson library function as designed by the contractor was not acceptable to the Air Force. During the FQT, and acceptable programming solution and attendant capability was developed. The general

concept of the selective lesson loading from tape to disk is that all lessons to be accessed during a given on-line period of operation will be identified prior to the commencement of that period. The off-line lesson building program was modified to permit the addition or reconstruction of the lesson file table of contents, based upon a control card input. This permits a new lesson to be added to an existing file or for the old contents to be completely replaced on a day-to-day or run-by-run basis. It is not possible however, to load additional lessons from tape to disk during an on-line session. If it should become critical to obtain access to additional lessons from tape during an on-line session, the CDTS can be closed down and additional lessons loaded from tape to disk in a relatively short period of time.

The on-line printouts of "trainee" and "course designer" actions as a result of executing the tests and inputting data in accordance with the scenarios are contained within Appendix IV.

In addition, the off-line printout of the test--OFLINE, depicting the errors and the on-line execution of the test after the errors were corrected are contained within Appendix IV.

Selected trainee records were compared against the on-line printout and the off-line listing of the test to verify the accuracy of the record content. No apparent discrepancies were found. A sample trainee record is also contained in Appendix IV.

Section IV

CONCLUSIONS AND RECOMMENDATIONS

This project provided members of the staff with valuable experience in several general areas:

- o The design and implementation of a modularized computer assisted instructional system.
- o The development, construction and validation of an extensive computer assisted training course with primary emphasis upon performance oriented tasks.
- o The extension of knowledge in the use and operation of third generation computers.

This experience is translated in this section into conclusions and recommendations for improvement to the current CDTS, additional capabilities and finally considerations for use of the CDTS as a research vehicle.

A. Improvements to the current CDTS

During the Formal Qualification Testing several suggestions for modifying and/or increasing the capability of the CDTS were expressed by members of the Air Force Test Team as well as project personnel. A summation of these comments follows. No attempt has been made to estimate the costs (manpower as well as additional system capacity requirements) to implement any or all of these suggestions.

- o Increase the 4ØØ character frame limit.

  Currently the course designer is somewhat confined by being limited to the use of only 4ØØ characters per frame. Although frames can be "split", this in turn reduces the potential number of frames available for a given lesson. Each "split" frame requires a different frame number which subtracts from the 3ØØ frame per lesson limit. In addition, the internal splitting of the answer and action groups is illegal. These groups must be complete within the specific frame in which constructed. This may severely limit the number of answer-choices either presented to the trainee for selection or provided for matching purposes as well as actions programmed as a result of the response entered by the trainee.

- o Redesign the Phonetic encoding process.

  The current Phonetic encoding process does not automatically allow for pluralization of responses. In many instances, a word pluralized is not equivalent phonetically to the singular version of the word. This requires that the course designer allow for variations of correct responses including in many instances--plurals. Also, the encoding processing should be examined to determine if a more efficient method could be developed to increase the sensitivity and thereby reduce the number of inappropriate phonetic equivalents which are now possible.

- Remove inactive users from the system.

  It is currently possible to remove all or selectively remove users from the system regardless of their status--active or inactive. However, the procedure to selectively remove users is considerably more complex. As the use of the CDTS increases, it can be predicated that the number of users (course designers/trainees/system demonstrators, etc.) will also increase and the User Control Table (UCT) may on occasion approach capacity. A more user oriented procedure to remove users from this table who are in an inactive status needs to be developed.

- Record clock time on individual history printout.

  It is not currently possible to automatically measure the amount of time a trainee takes to enter a response to a specific question within a lesson nor accumulate the total time necessary to negotiate a specific lesson. Collection of these data must be accomplished manually requiring manpower and time expenditures beyond the usual available resources. Having the CDTS include a time parameter as a data item within the performance records currently maintained would make this information readily available to appropriate Air Force personnel responsible for the validation of lesson material.

- Increase the number of frame labels.

  Currently, the CDTS permits the labelling of 50 frames. The ability to branch to a labelled frame using the GOTO option was especially useful during validation to recover or circumvent lesson errors, machine and/or program failures which disrupted the training session. Still, in many instances, lesson material had to be repeated unnecessarily as the number of labelled frames was severely limited. The number of labels permitted should be increased or the ability to GOTO a frame number be added to permit more discrete recovery from lesson disruptions.

- Record exact trainee responses.

  Currently the CDTS records only the letter which was selected for input by the trainee in response to a multiple-choice question or the letter which matched the inserted response in the question frame. As a diagnostic tool, the recording of the exact response input by the trainee would aid immeasurably the task of course designers in analyzing existing lesson material for further modification and/or additional material. The impact on the immediate storage requirements and response processing would have to be assessed.

- Additional prompting.

  In this initial design of the CDTS there is a minimum of information generated to assist the user during the building of a lesson. When a message or cue is output there is no additional information provided if the user doesn't fully comprehend. It was suggested that the current set of messages be linked to an additional level of expository messages which would be output when requested by the course designer. This could be made to provide the bare rudiments of a tutorial dialogue.

B. Additional Capabilities

During the design of the CDTS certain functions were restricted or excluded to enable the system to be designed, developed, tested and ready for release in a timely manner. However, it is felt that certain of these capabilities would be most advantageous and should be given further consideration to increase the efficiency and application of the CDTS.*

- On-line assistance to the Trainee.

  Unless provided by the course designer within the context of the lesson material, the trainee cannot receive additional assistance during lesson execution. One method to provide assistance to the trainee is to build it into the lesson. An attempt to provide assistance to the trainee in this manner is extremely difficult to construct, anticipate where or when the assistance will be required and tailor the information to the individual trainee needs. However, it is felt that certain guidelines could be determined and programmed into the CDTS. If it were determined that certain information would be variable, provision could be made to allow the course designer to insert the necessary information.

- Lesson Presentation Media.

  Currently the CDTS is designed to interface only with the Frieden Remote Terminal. This is restrictive in the rate in which information can be presented as well as the type of information. A keyboard/printer severely limits the presentation of graphic displays. The CDTS should be modified to enable interfacing with appropriate cathode ray tube equipment to permit the timely presentation of

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* Certain capabilities were discussed at conferences/meetings conducted during the tenure of this project.

textual as well as graphic material. In addition, the keying of responses should be supplimented by providing the user the ability to input information via a light pen device. Coupled with these capabilities could be provided the ability to control though the lesson frames audio visual devices, tape recorders, etc. In effect, the CDTS should be modified to permit the interface and control of various multi-media devices to increase the course designers sphere of lesson construction capability with the attended benefits transferring to the trainee in the manner of presentation and response.

- Calculation capability.

  A computational capability was excluded from the initial design of the CDTS. No mathematical capability is available for use by the course designer as a separate tool outside of lesson construction or within the context of the lesson. Similarly, the trainee must insert an exact numeric response to receive proper credit. The CDTS is incapable of determining whether programmed answers/inserted responses are algebraically equivalent.*

  At a minimum, the ability of the CDTS to perform calculated numeric matching during the execution of a lesson should be available. This would reduce the necessity of the course designer to provide various combinations and permutations of numeric answers in anticipation of what a trainee might insert. The course designer could then rely upon a "built-in" answer/response numeric comparison processor.

  Depending upon the capability provided, the course designer as well as the trainee should be able to define and manipulate functions and matrices and call upon various computational service routines. While receiving on-line instruction, the trainee should be able to construct mathematical functions for his own individual use as needed for problem-solving. A trainee could label the functions he creates and use them whenever he needed them--in effect, he could create his own library of computational aids for problem solving.

  The course designer could couple the computational capability with the decision language already existing within the CDTS to more finely control the trainee's path or sequence through the lesson. For example, in addition to trainee performance data automatically stored by the CDTS, the course designer might wish to keep track of the trainee's current position in the lesson or whether in a review status for subsequent use in a conditional decision statement.

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* During the Phase I and II validation activity, an exhibit handbook (TM-(L)-3725/012/02) was used to present tabular and graphic presentations in lieu of a cathode ray tube.

- Lesson Construction Quality Control.

  The CDTS provides a minimum of quality control during the construction of lesson material by a course designer either on-line or off-line. Apart from determining whether legal labels have been inserted or decision statements have been properly stated, the responsibility of properly constructed lessons falls upon the course designer. This requires that the course designer execute (on-line) the lesson as a "trainee" attempting to check out various sequences to ensure that the material is logically constructed. This takes course designer time as well as on-line computer time.

  An additional capability should be added to the CDTS to automatically quality control lesson material for logical construction. This could be accomplished off-line. For example: the lesson material could be checked to determine that all branches are legal, frames contain the required groups and are in the proper sequence when split and correct responses have been included when required. Having determined that the lesson was constructed "logically", the course designer could devote his time and the computer's to determine if the material is meaningful to the target population.

- Response Latency Control.

  There is no method available to control the length of time in which to anticipate an inserted response by a trainee before a programmed intervention can be executed.

  A trainee could "sit" an excessive length of time without receiving any prompts or aids to assist him in proceedings with the lesson material. To circumvent this deficiency the CDTS could be modified to provide a tolerance parameter in which to anticipate a response. If the trainee did not respond within a specified time period, the program would initiate the action provided by the course designer.

In addition to these specific capabilities which were restricted or avoided in the initial design of the CDTS, it became apparant during the life of this project that other capabilities/recommendations should be considered for the future versions of the CDTS. Two of the more important as well as feasible additions are:

- A CDTS internally controlled review.

  Although a trainee can GOTO a frame labelled REVIEW, this is a limited capability. A function built into the CDTS could permit the trainee to request REVIEW at any time and the program would print out the topics/sections available for selection. (Topics/sections would be specified by the course designer during lesson

construction.) The trainee could review any time after completing the first topic. The program would prevent a trainee from reviewing a topic until completion of that topic had occurred. At the end of each topic reviewed, the program could query the trainee as to whether he wished to review additional material or return to the appropriate point within the lesson.

- Group Summary of Trainee Records.

  The automatic capability to summarize more than one individual trainee's record of performance is nonexistent. To obtain an estimate of several trainee's performance who are taking the same lesson material requires manual data manipulation. A capability to provide summation data for one or more trainees should be provided to enable Training Supervisors to better assess trainee progress and performance across various courses of instruction.

C. Further Implications

The CDTS was pointedly designed to provide the Air Force a computerized vehicle to meet many of the varying on-the-job requirements within an operational environment. And, as part of this project an initial step (the computer operator's course) was instituted toward meeting one of these requirements.* In addition to this specific course, the capability now exists to develop and implement additional courses in such varied areas as finance, transportation, inventory control, programming, etc. These courses could be standarized or tailored to fit individual requirements at specific installations. Also, each installation which had the CDTS could develop specialized material to meet additional training or operational requirements.

Developing a programming course could not be adequately accomplished using the current CDTS. The theory, rules, regulations and conventions of the programming language under consideration could be taught using a CAI approach. However, to provide the trainee with the ability to develop his own programming routines, check them out and provide error messages and remedial material, would require several changes to the CDTS. The CDTS would have to be able to simulate the syntax processing of the specific compiler or be able to gain access to an actual compiler. This would permit the trainee to develop his programming routines and have them operated upon in a realistic manner.

Finally, as an aid in the implementation of the CDTS, lesson material could be developed in the CDTS language that would teach potential users how to use the system. Not only the language structure, conventions and restrictions, but "how" certain capabilities can be used and "why". This material would supplement the user's manual.

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* The Base Level System is primarily for management use. The CDTS was designed to train users of the Base Level System.

Apart from the practical application of the CDTS, it should be considered for use as a research tool. The use of CAI techniques as they pertain to performance related tasks needs further investigation. At various points in the Computer Operator's Course the trainee was instructed to leave his training device and perform "hands on" training to complement the tutorial material. This blend of tutorial material with "hands on" training is at best difficult to achieve in an effective manner.

The CDTS could be used to develop material which could be directed toward areas such as:

- When and how could tutorial and "hands on" training be complemented?
- Where or how can CAI be applied in team related tasks?
- Cost factors involved in the incorporation of audio/visual devices. Is the increase in learning (if any) worth the cost?
- What is the application for CAI at the command and control level?

to indicate a few.

In conclusion, it is recommended that the improvements to the current system as well as the additional capabilities be given strong consideration for implementation. This would greatly aid the production and presentation of training material, facilitate the operation of the system, and permit increased data analysis of individual/group performance. Finally, the use of the CDTS as a research tool should be exploited.

Section V

PROJECT PERSONNEL

Dr. John W. Cullen, Project Head, Advanced Projects, was principal investigator for this project and supervised the full time effort of these project members for the entire term of the project.

Mr. Alfred K. Butler, Human Factors Scientist, responsible for the Operational Specifications, Users Manual for the CDTS and field validation of the Computer Operator's Course.

Mr. Richard S. Cowdery, Computer System Specialist, responsible for coordinating the overall programming effort for the design, development, assembly, and test of the CDTS.

Mr. Larry R. Harris, Human Factors Analyst, Senior, responsible for the coordination and development of the Computer Operator's Course Material.

During this project, personnel were brought on board for varying levels of effort to assist in the development of the CDTS and the Computer Operator's Course.

Name	Title
Peshek, L. D.	Programming Analyst Senior
La Point, J. E.	Computer Programmer Analyst, Senior
McBane, D. K.	Programming Analyst Senior
Pratt, E. M.	Programming Analyst Senior
Hourigan, J. P.	Human Factors Scientist
Dagley, H. C.	Human Factors Analyst, Senior
Maginnes, E. B.	Human Factors Analyst, Senior

Two student associates, Mr. Edward Brill, Stanford University and Mr. John Keats, Florida State University, worked full time on the project during the summer of 1967 and 1968 respectively in residence in Santa Monica. Mr. Keats developed the initial material for Lesson 2 - Number Systems for the Computer Operator's Course and Mr. Keats transcribed Lessons 1-8 of the Computer Operator's Course from the operational specifications into PLANIT lessons ready for conversions into the CDTS format.

Section VI

PROJECT DOCUMENTATION

ESD TR-68-152

Operational Specification for a Computer-Directed Training Subsystem for Integration into the Air Force Phase II Base Level System, 15 March 1968.

ESD-TR-68-301

Performance/Design Requirements and Detailed Technical Description for a Computer-Directed Training Subsystem for integration into the Air Force Phase II Base Level System, June 1968.

TM-(L)-3724/002/00

Test Plan for the Validation of the Computer Operator's Course Module, 15 December 1968.

TM-(L)-3724/003/02

Category I Test Plan Computer-Directed Training Subsystem for Air Force Phase II Base Level System, 1 August 1969.

TM-(L)-3724/004/01

Users Manual Computer-Directed Training Subsystem for Air Force Phase II Base Level System, 30 October 1969.

TM-(L)-3724/005/00 Draft

Formal Qualification Test Results Computer-Directed Training Subsystem for Air Force Phase II Base Level System, 1 August 1969. (The substance of this document has been included within this document as Part III, Testing and Evaluation and Appendix D)

TM-(L)-3724/006/00 DRAFT

Detail Specification Part II Computer-Directed Training Subsystem for Air Force Phase II Base Level System, 12 November 1969.

TM-(L)-3725 Volume 001 through 018

Computer Operator Material for a Computer-Directed Training Subsystem for Integration into the Air Force Phase II Base Level System, 15 March 1968. (Final lesson documentation will be released as off-line listings. The outline and course objectives are presented in Appendix B).

The validated Computer Operator Course Exhibits TM-(L)-3725/012/02 dated 1 July 1969 will be released with the off-line lesson listings.

In addition to these documents, monthly reports for contract F19628-68-C-0399 P001 were issued as TM-4027, Volume 000 through 015 and quarterly reports for contract F19628-67-C-0427 P002 were issued as TM-4142, Volume 000 through 005.

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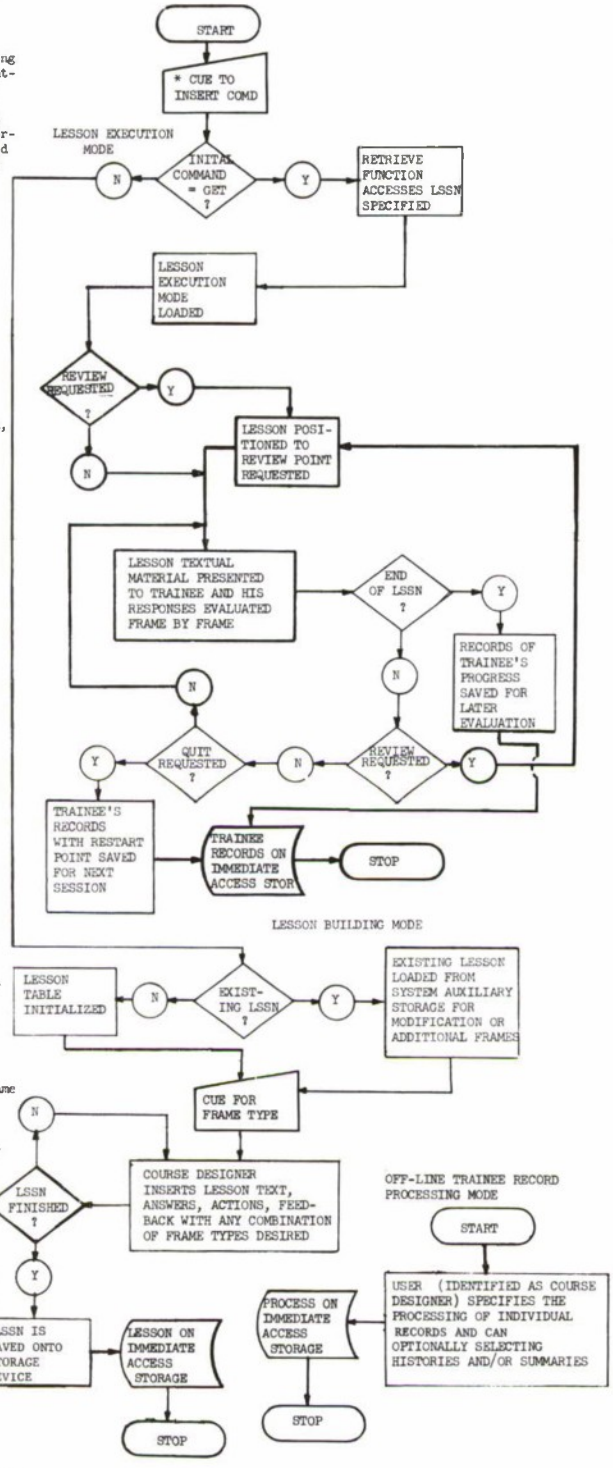
Appendix I

FLOW DIAGRAM OF THE CDTS

This Appendix presents the system flow for the Computer-Directed Training Subsystem.

SYSTEM FLOW



The Computer-Directed Training Subsystem permits the presentation of lesson material to trainees through the Lesson Execution Mode. Material is presented on line in an interactive environment. Inserted answers are processed by the program and compared with the answers specified within the lesson for a possible match.

Based upon the answer-matching process, the program executes the appropriate action. The answer-matching tolerance may be increased through the use of PHONETIC encoding, KEYWORD matching and ORDER sequencing.

The trainee may review selected parts of the lesson, discontinue a particular session and return to the proper point in the lesson at a subsequent session.

This mode permits on line construction of course material. After initial program load the user may insert the command to commence building a lesson.

Lesson material is inserted within a series of units termed "frames".

The program presents the frame types for selection. The program branches from group to group within the frame type selected permitting the insertion of textual material, answers and subsequent actions. Decision statements can be formulated and entered into the lesson.

As each frame is constructed the program stores the content in the lesson table, branches to the Frame Selection Function and the process may be repeated. The course designer may preserve course material onto an appropriate peripheral component with a name and ID associated with it.

The program stores historical records of the trainee's path and answers through the lesson in a Trainee Record Table. This table may be processed for off-line Individual Summary as well as History data.

Appendix II

COMPUTER OPERATOR'S COURSE OUTLINE, OBJECTIVES AND SAMPLE OF COURSE MATERIAL

This Appendix presents the Computer Operator's Course Outline and Objectives. In addition, an example of lesson material from both the course design and trainee standpoint is included.

COURSE OUTLINE

I. ORIENTATION AND INTRODUCTION TO COMPUTER CONCEPTS

A. Introduction to Computer Concepts

1. Dispelling computer myths

a. They don't think

b. They are controllable instruments of man

2. Explicitness of man-machine communication

3. Definitions

a. Lack of universal definitions

b. Data base

c. Calculator vs. computer

d. Program--computer operator

e. Hardware--software

f. DP--EDPM--EAM--PCAM--EDP/ADP

4. Historical sketch

a. Babbage--father of computers

b. Hollerith--punched cards

c. World War II--advent of electronics

d. UNIVAC--commercial availability

5. Generations

a. First--tubes

b. Second--transistors (solid state)

c. Third--microminiaturization

B. Characteristics/Configurations

1. Digital/analog-hybrid

2. General purpose vs. special purpose

3. Solid state--cooler, smaller, faster

4. Instruction repertoire

5. Limited vs. modular design

II. NUMBER SYSTEMS

A. Basic Terms

1. Sum

2. Product

3. Factor

4. Base of number system

B. Exponentiation

1. Base

2. Exponent

3. Order of operations

C. Number Systems Symbols

1. Decimal

2. Binary

3. Octal (triads)

4. Hexadecimal (quadrads)

D. Calculations and Exercise

1. Expansion

2. Addition

3. Complementation

III. BASIC COMPUTER COMPONENTS (ELEMENTS/UNITS)

A. Definition of CPU

B. Storage (Memory)

1. Word

a. Data

b. Instruction

2. Memory register (cell)

3. Bits (are located)

4. Location (address)

5. Bytes

6. Number of stored locations

7. "K" concept

8. Word length

9. Types of memory (internal storage)

a. Core (ferrite)

b. Thin film

C. Arithmetic Unit

1. Accumulator

2. Memory image transfer

D. Control Unit

1. Memory buffering

2. Parity

3. Cycles

a. Machine

b. Instruction

c. Execution

E. Input/Output Units

IV. COMPUTER SYSTEM AND PERIPHERAL UNITS

A. Criteria for Evaluating Storage Devices (capacity--speed--reliability--cost--power requirements--physical size)

B. Common Types of External Storage Media

1. Punched cards

a. Binary

b. Symbolic

c. Hollerith code

2. Magnetic tape

3. Magnetic drums

4. Disks

5. Paper tape

C. Input/Output Configuration

1. Cards via card reader and punch (I/O)

2. Magnetic tape via tape unit (I/O)

3. Magnetic drums (I/O)

4. Disks (I/O)

5. Paper tape via paper tape reader and punch (I/O)

6. Electric typewriter (I/O)

7. Console (keyboard = I, CRT = O)

8. Printer (paper - O)

D. Definitions

1. Reading

2. Writing

E. Control Units

F. Timing

1. Millisecond

2. Microsecond

3. Nanosecond

4. Access time

5. Add time

G. Access Types

1. Direct

2. Sequential

V. DATA REPRESENTATION

A. General

1. Media specific

2. Types of transfers

B. Binary

C. Codes

1. BCD

2. EBCDIC

D. Bytes

1. Hexadecimal machine

2. Octal machine

E. Fractional Number Representation

1. Fixed point

2. Scaling

3. Floating point

a. Advantages

b. Disadvantages

VI. PROGRAM DESIGN

A. System Establishment

1. Customer (CU).

2. Formulator (F). Functional Area Analyst

3. Designer (D). Data Systems Analyst; Design Specialist.

a. Flow chart

b. Decision table

4. Coder (CO). Programmer Specialist

5. Machine (M). Data Processing Machine Operator

B. Flow Charting

1. Types

a. General system, MACRO

b. Detailed program, MICRO

2. Advantages

3. Conventions (standard symbols)

VII. PROGRAMMING LANGUAGES

A. Machine Language

B. Symbolic Code; Mneomonic Operation Code

1. Instruction classes

a. Arithmetic

b. Sequence control

c. Data movement

d. I/O

e. Comparison

2. Macro instructions; library routines

C. Assembler

1. Source program

2. Object deck

D. Procedure Oriented Language

1. FORTRAN

2. COBOL

E. Compiler

1. Generator

2. Translator

F. Report Program Generator

VIII. OPERATING SYSTEMS

A. Definitions

B. Functions

C. Utility Programs

D. Types

1. Batch processing; job stacking

a. Computer job shop (closed shop)

b. Supervisory time

c. Turnaround time

d. Throughput

e. Operating efficiency

2. On/off line

3. Time sharing; Multiprogramming

a. Advantages

b. Background, foreground

E. Third Generation

a. Industrywide

b. Advantages

IX. INTRODUTION TO B 3500 SYSTEM

A. B 3500 system

1. Modularity

2. Third generation

3. Multiprocessing

B. Software

1. Operating system

a. Master control program

b. Functions of MCP

2. Compiler

a. FORTRAN compilers

b. COBOL compilers

3. Others

a. Advanced assembler

b. Advanced sort generators

c. Auxiliary programs

C. Base Level Components

1. Central processor

a. Display panel

b. Control panel

2. Console printer and keyboard

3. Core memory modules (Range)

4. Peripheral equipment (Diagram)

a. Card reader

b. Card punch

c. Magnetic tape units (MTU)

d. Disk storage unit

e. Line printer

5. Remote terminals

D. Arithmetic Capability

1. Fixed point

2. Floating point

3. Decimal machine

E. Data Representation

1. Bytes

a. Two digits

b. Eight bits = two digits

c. Two bytes = one word

d. Addressing = ½ byte (digit)

2. ASCII

3. BCL

4. EBCDIC

X. PERIPHERAL EQUIPMENT--LOW DATA RATE

A. Card Reader

1. 800 CPM

2. Under the control of an I/O control unit

3. Reads column by column beginning with 1

4. Interchangeability

5. Card Hopper--capacity 2400 cards

6. 9s row down and facing in

7. Reading station

8. Ends in a stacker

9. Control panel switch/indicators

   a. Power on/Power off

   b. Start/Stop

   c. Not ready

   d. Feed check

   e. Validity check

   f. End of file

   g. Reset

   h. Validity on

   i. Read check

10. Hands on training

B. Card Punch

1. 300 CPM

2. Hopper holds 500 cards

3. Placement - 12 edge down and in

4. Follow block

5. Punch and post punch read stations

6. Stackers

   a. Primary

   b. Error

   c. Auxiliary

7. Control Panel Switch/Indicators

    a. Power on/Power off

    b. Start/stop

    c. Not ready

    d. Feed check

    e. Punch check (on)

    f. Runout

    g. Reset

8. Hands on training

C. Line Printer

1. 1100 LPM/high speed slew

2. 132 PP

3. Forms

4. Control Tape

    a. Feeding and spacing

    b. Changing

5. Control panel switches/indicators

    a. Power on/Power off

    b. Skip to heading

    c. Ready/Not Ready

6. Duplicate switches/indicators

7. Hands on training

XI. PERIPHERAL EQUIPMENT--HIGH DATA RATE

A. Magnetic Tape Units

1. Types
    a. Free standing - 9391
    b. Clustered - 9381
2. Reels
    a. Take-up
    b. Supply
    c. Size 8½" and 10"
    d. Ring
3. Load Point
4. End of tape
5. Speed
    a. Normal
    b. Highspeed rewind
6. Reading--either direction
7. Mounting procedures
8. Control panel switch/indicators
    a. Unit designator
    b. Power on/power off
    c. Load
    d. Unload
    e. Local
    f. Remote
    g. Write ring
    h. Rewind
    i. Density

9. Button actions

    a. Load

    b. Rewind

    c. Unload

10. Hands on training

B. Disk File Electronics Unit (DFEU)

1. Controls the disk file modules

2. Control Panel switch/indicators

    a. Power on/Power off

    b. Not ready

    c. DC on/DC off

    d. Master lockout

    e. Disk lockout

C. Disk File Modules

1. Physical characterisitics

    a. Nonremoveability

    b. Total capacity

    c. Tracks per disk

    d. Segments per track

    e. Number of disks

2. Types of....(logical)

    a. System disk

        1) MCP

        2) Tables and directories used by MCP

b. Users disk

1) Programs

2) Data files

3) Compilers

3. Files

a. Permanent

b. Temporary

XII. OPERATORS CONSOLE AND SUPERVISORY PRINTER/KEYBOARD - 9340

A. Printer/Keyboard

1. Acronym SPO

2. Specifics

a. CTRL

b. ENQ

c. ETX

d. NAK

e. Power switch

3. SPO operating procedures

a. Start operations

b. Erase message

c. Terminate message

B. Operator's Console

1. Display Panel

a. Nixie tube

1) Number representation 0 - $\overline{5}$

a. Digits 0 - 9

b. Undigits $\overline{0}$ - $\overline{5}$

c. Hexadecimal equivalence

b. Left Group

1) OP AF BF

2) Memory address

3) Program address

c. Right Group

1) Instruction address

2) Memory information

3) Base

4) Limit

2. Channel indicators

3. Fixed message displays

C. Control Panel

1. Keys

a. Information entry (16)

b. Power on/off switches

c. Display control and information entry (13)

1) CL

2) LD

3) STOP/RUN

4) SI

5) OP

6) A,B,C

7) PA

8) AD

9) WR

10) Skip

11) Read

12) Emerg. Pull Off

13) Term

2) Normal

3) Universal load

XIII. SYSTEM SOFTWARE AND INTERVENTION (Part 1)

A. Definitions

1. Disk directory table

2. Scratch tape

3. Breakout

4. System log

5. File opening

B. System Load Procedures

1. MCP loaders

a. Simple start

b. Cold start

2. System loader control deck

a. Cold start control cards

1) Required cards

2) Optional cards

b. Start requiring replacement of the MCP (simple loader)

    1) Required cards

    2) Optional cards

    3) Required sequence of cards

c. Program control cards

    1) Compile

    2) Execute

    3) Remove

    4) Dump

    5) Load

    6) Change

    7) Label

    8) Data

    9) Restart

    10) Unit

    11) End

d. Program parameter cards

    1) Priority

    2) File

    3) Core change

    4) Value

    5) Charge

XIII. SYSTEM SOFTWARE AND INTERVENTION (Part 2)

A. System Output Messages

1. Format differences

a. Messages requiring operator action

b. Messages signaling discontinuation of a program

c. State of processing messages

2. Message categories

a. Errors

1) Hardware

2) Data

3) Program

b. Requirements

1) Peripheral

2) Data

c. Results - MCP response to query

1) Input query messages

2) Input commands

3) Options

B. Introduction of Data and Program Files into the System

1. When they can be introduced

2. How they can be introduced

a. Data

1) Card files in reader

2) Pseudo card decks

3) SPO input messages

b. Programs

1) Program scheduled

2) Operator scheduled

3. Mix versus Schedule

4. Precedence link feature

a. Purpose

b. Method of using

5. Pseudo card readers

a. Purpose

b. Messages pertaining to pseudo card readers

C. Operator-System Interaction

1. Inserting Control information - CC message

2. Loading a program - LD message

3. Unit status - OL message

4. Control of Pseudo Card Readers - RN message

5. Removal of control decks - RD message

6. System options

a. Enabling options

b. Disabling options

c. Messages involving options

7. Log maintenance

a. Operator response to MCP warning messages

b. System response to operator answer

8. Using the mix index-MX message

9. Interrupting programs

    a. BK message

    b. BR message

10. Restarting programs - RB message

11. Suspending - terminating programs

    a. RS message

    b. DS message

    c. ST message

    d. Reasons for suspending

12. Reinstating a suspended program

    a. OK message

    b. GO message

13. Additional system operator actions

    a. WS message

    b. RS message

D. Program Failure and Debugging

1. Detection of program failure

    a. Repeated output messages

    b. Opening and closing files

    c. Exceeding time required for execution

2. Memory dump

    a. DM message

    b. DP message

3. Program trace

    a. GT message

    b. NT message

COURSE OBJECTIVES

I. ORIENTATION AND INTRODUCTION TO COMPUTER CONCEPTS

1. To be able to identify the following statements as being true:

   a. Computers don't think.

   b. Computers are controllable instruments of man.

2. To be able to state that communication with the computer must be EXPLICIT.

3. To be able to state that universal definitions of computer terms has not been accomplished.

4. To be able to pick DATA BASE from a list of terms as being most resembling words such as 'dictionary' and 'encyclopedia.'

5. To state that INTERNALLY STORED PROGRAMS are the main way that a computer differs from a calculator.

6. To be able to write PROGRAM when asked what machine instructions are called which tell the computer what you want it to do.

7. To be able to pick COMPUTER OPERATOR from a list as being the person who is responsible for introducing the program into the machine.

8. To be able to write the following terms when presented with their appropriate definitions.

   a. Hardware - The pieces of equipment which make up the physical machine and all its components.

   b. Software - All of the non-equipment and non-personnel aspects of a data processing system.

9. To be able to define the following abbreviations:

   a. DP--Data Processing

   b. EDPM--Electronic Data Processing Machines

   c. EAM--Electronic Accounting Machines

   d. PCAM--Punched Card Accounting Machines

   e. EDP--Electronic Data Processing

   f. ADP--Automatic Data Processing

10. To identify EDP and ADP as being synonymous.

11. When presented with terms such as card sorter, interpreter, or collator, can identify these as being PCAM rather than EDPM.

12. Demonstrate the ability to match:

    a. Babbage - Father of computers

    b. Hollerith - Punched cards

    c. World War II - Advent of electronics

    d. UNIVAC - Commercial

13. Ability to differentiate the three types of computer Generations by the use of the following key words...

    a. 1st - Tubes

    b. 2nd - Transistors (solid state)

    c. 3rd - Micro-miniaturization

14. Can demonstrate the ability to match:

    a. Digital computer - counts

    b. Analog computer - measures

15. To supply the term HYBRID as being a combination of a digital and an analog computer.

16. To be able to pick VERSATILITY from a list as being the key word which differentiates the general purpose from the special purpose computer.

17. Can list two advantages of a solid-state computer. These two advantages must be from the following list:

    a. Faster

    b. Smaller

    c. Less heat

18. To be able to pick out the statement 'What the computer can do' from a list of statements in answer to the question "What is the INSTRUCTION REPERTOIRE of a computer?"

19. To be able to pick out that 3rd generation computers contain both scientific and commercial instructions as part of their instruction repertoire.

20. To fill the word MODULAR as being the type of design to which components can easily be added.

II. NUMBER SYSTEMS

1. Ability to define BASE of a number system as being the total amount of different symbols used in that system.

2. To be able to state that:

   a. SUM refers to addition

   b. PRODUCT pertains to multiplication

   c. FACTORS are the same as numbers/symbols

3. To be able to identify, in the expression b**n, that n is called the EXPONENT (POWER) and that b is called the BASE.

4. To be able to define the nth power of a number b as: 'b multiplied by itself n times.'

5. To be able to work any simple problem reflecting that the Øth power of a nonzero number equals one, (e.g., b**0=1 for any number b, other than zero, since Ø**Ø=Ø).

6. To be able to list the highest symbol for the following number systems:

   a. HEXADECIMAL -0 1 2 3 4 5 6 7 8 9 A B C D E F

   b. DECIMAL -0 1 2 3 4 5 6 7 8 9

   c. OCTAL -0 1 2 3 4 5 6 7

   d. BINARY -0 1

7. Write HEXADECIMAL as being the number system that is used in most third generation computers.

8. Is able to pick from a list, the correct order of arithmetic operations. The correct order is as follows:

   a. EXPONENTIATION

   b. MULTIPLICATION

   c. ADDITION

9. Is able to define TRIAD as a group of 3 binary digits and can convert and reconvert any Octal number to groups of triads.

10. Is able to define QUADRAD as a group of 4 binary digits and can convert and reconvert any Hexadecimal number to groups of Quadrads.

11. Given various combinations of symbols; state which number systems these symbols are:

    a. HEXADECIMAL

    b. DECIMAL

    c. OCTAL

    d. BINARY

12. To be able to write any number of the following systems as a decimal number.

    a. HEXADECIMAL

    b. OCTAL

    c. BINARY

13. To be able to add any two symbols in the following number systems.

    a. HEXADECIMAL (e.g., 9+B=14)

    b. OCTAL (7+6=15)

    c. BINARY (1+1=1Ø)

14. To be able to complement (via exercises) any symbol contained within the following numbering systems.

    a. HEXADECIMAL

    b. DECIMAL

    c. OCTAL

    d. BINARY

15. To be able to state that most computers subtract by the method of complement addition.

III. BASIC COMPUTER COMPONENTS (ELEMENTS/UNITS)

1. To be able to define CPU as standing for Central Processing Unit.

2. To be able to list...

   a. Storage (memory)

   b. Arithmetic unit

   c. Control unit

   as constituting the CPU.

3. To be able to fill in the empty boxes when presented with a diagram of computer components (elements/units).

   a. Storage (memory)

   b. Arithmetic unit

   c. Control (executive) unit

   d. Input unit

   e. Output unit

4. To be able to state STORAGE (memory) elements in the computer component in which all data must be placed before being processed by the computer.

5. To be able to list:

   a. Data words

   b. Instruction words...

   as being the two types of words which are stored within the computer. (In terms of use)

6. To be able to pick out the correct definitions for the terms:

   a. Word

   b. Register

   c. Address

   d. Location

   from a list of alternatives

7. To identify that a word is composed of BITS.

8. To be able to define the acronym BIT as a binary digit.

9. Ability to define BYTE as being a fixed number of BITS.

10. Ability to match the following:

    a. 8 bits - Hexadecimal machine byte

    b. 6 bits - Octal machine byte

11. To be able to pick from a list, the term THOUSANDS, when asked the usual number of memory registers contained in a computer.

12. Given a list of letters, be able to pick the letter "K" as representing 1ØØØ.

13. To be able to indicate that all the BITS which comprise a word have a unique number.

14. To be able to list:

    a. Core

    b. Thin film

    as being the two basic types of memory (internal storage).

15. To select all of the following from a list as being characteristic of core.

    a. Shaped like doughnuts

    b. Extremely small

    c. Allow magnetization

    d. Ferrite

16. To select 'magnetization occurring in either one direction or another' from a list of alternatives as being characteristic of an element of core.

17. To be able to pick out THIN FILM as being the fastest, when presented with a list of storage media.

18. Given a list of storage media, be able to pick out THIN FILM as a media <u>not</u> currently being used for bulk storage.

19. To be able to state ARITHMETIC as the unit which contains all the circuitry and registers necessary for the performance of any and all computations.

20. To choose from a list, the term ACCUMULATOR, as that portion of the arithmetic unit which normally contains the results immediately following an arithmetic operation.

21. To pick IMAGE from a list of words when asked what is transferred from memory.

22. To supply the word CONTROL for the definition, 'a device used for management of the computers operations.'

23. To be able to list 2 of the following 3 points concerning a MEMORY BUFFER:

    a. The place where all data must pass on its way to and from memory.

    b. Where parity is checked.

    c. Where time buffering occurs.

24. To be able to supply the word PARITY for the definition, 'hardware feature which allows one to detect inaccurate data transfers.'

25. To be able to supply the word PARITY ERROR in describing what the above inaccurate data transfers are termed.

26. To be able to match:

    a. Machine cycle - a fixed interval of time in which a computer operation occurs.

    b. Instruction cycle - the cycle in which the operation to be performed is brought into the control section and examined.

    c. Execution cycle - cycle during which the operation is carried out.

27. To be able to define the acronym I/O.

28. To be able to pick out I/O UNIT from a list of terms as being a device which operates under the control of the CPU and is used to transmit data to and from internal storage.

IV. COMPUTER SYSTEM AND PERIPHERAL UNITS

1. To be able to list 3 of the 6 criteria for evaluating storage elements. The list is as follows:

   a. Capacity

   b. Speed

   c. Reliability

   d. Cost

   e. Power requirement

   f. Physical size

2. Be able to list 4 of the following 5 common types of external storage media. The 5 media are:

   a. Punched cards

   b. Magnetic tape

   c, Magnetic drums

   d. Disks

   e. Paper tape

3. To be able to associate:

   a. Binary card - image of memory.

   b. Symbolic card - punches on cards which represent letters, numbers, and symbols.

4. When asked what code is punched on a card via a keypunch, the student must be able to pick out HOLLERITH from a list of words.

5. To pick out MAGNETIC TAPE from a list of storage media as being where more data are probably stored than any other place.

6. Give a partially completed diagram of INPUT/OUTPUT configuration, the trainee is able to write in the names of various media and devices into the appropriate blank boxes.

7. To be able to match the following:

   a. Reading - information transferred from external equipment to memory.

   b. Writing - information transferred from memory to external equipment.

8. To select the writing of a core image out on some media as opposed to losing what was contained in the core registers, etc. from a list of alternatives as characteristic of 'core dump'.

9. To relate the I/O devices' ability to transmit data as being MUCH SLOWER than the CPU's ability to process the data. The choices are:

   a. Faster

   b. About the same

   c. Slower

   d. Much slower

10. Identify that more than one line is the characteristic of MULTI-CHANNEL I/O.

11. To pick CONTROL UNIT from a list of terms when asked what the name of the device is which is used in conjunction with multiple channels to relieve the I/O bottleneck.

12. To be able to match the following:

   a. Millisecond - thousanth of a second

   b. Microsecond - millionth of a second

   c. Nanosecond - billionth of a second

13. To be able to match the following:

   a. Access time - getting and putting back information from storage to memory.

   b. Add time - accumulate or perform a simple addition computation.

14. To be able to match the following:

    a. Direct Access - Core, Drum, Disk

    b. Linear (Sequential) Access - Tape

V. DATA REPRESENTATION

1. Is able to match the following input media with associated methods of physically presenting data.

    a. Punched Cards - The presence or absence of rectangular holes in specific locations.

    b. Paper Tape - The presence or absence of small circular holes.

    c. Magnetic Tape, Drums and Disk - The presence or absence of magnetized spots (BITS arranged in specific patterns).

2. To be able to recognize all of the following as being ways data are transferred, even though representation may be different.

    a. Punched cards to magnetic tape.

    b. Magnetic tape to punched cards

    c. Paper tape to disk

    d. Magnetic tape to drums

    e. Disk to paper tape

3. To be able to pick out BINARY as being the way data are stored in most computers.

4. To be able to define EBCDIC as "Extended Binary Coded Decimal Interchange Code."

5. To be able to match the following:

    a. BCD - The system that uses 6 BITS to represent numbers and letters.

    b. EBCDIC - The system which uses 8 BITS to represent more characters.

6. When asked what 2 forms of encoded data can be contained in a BYTE or a HEXADECIMAL machine, the trainee can respond...

   a. 1 EBCDIC character

   b. 2 Hexadecimal digits

7. When asked what 2 forms of encoded data can be contained in a BYTE on an OCTAL machine, the trainee can respond...

   a. 1 BCD character

   b. 2 Octal digits

8. Is able to encode and decode alphanumeric information expressed in...

   a. BCD

   b. EBCDIC

   This will be able to be accomplished by direct lookup, as this information will be presented in tabular form with supplementary panels.

9. To supply the word FIXED POINT when given the statement 'A format in which the programmer is concerned about the location of the decimal (binary) point within the machine.'

10. To state SCALING as the process by which the programmer allocates the above mentioned point.

11. To supply the word FLOATING POINT when given the statement 'A format in which the computer itself allocates the exact position of the decimal (binary) point.'

12. To be able to identify the following 3 as being advantages of FLOATING POINT over FIXED POINT.

    a. A larger range of numbers can be presented.

    b. Greater accuracy can be acquired in computation.

    c. Numbers with different decimal (binary) points can be added without the programmer having to scale.

13. To be able to pick out SLOWNESS, in terms of machine time, as being the major disadvantage of floating point arithmetic.

14. To be able to match:

    a. Fixed Point - Commercial computer

    b. Floating Point - Scientific computer

VI. PROGRAM DESIGN

1. To be able to list the five ingredients for system establishment. They are:

    a. Customer

    b. Formulator

    c. Designer

    d. Coder

    e. Machine

    The prompts Cu, F, D, Co, and M, will be present.

2. To be able to equate the following in column A with column B, followed by column B with column C.

	A		B	C
a.	Cu	-	Has a need	
b.	F	-	Writes specifications	- Functional Area Analyst
c.	D	-	Design the system	- Data Systems Analyst/ Designer
d.	Co	-	Puts into machine instructions	- Programmer Specialist
e.	M	-	Does it	- Data Processing Machine Operator

3. To be able to list both methods available to the Data Systems Analyst for performing his task. The two methods are:

    a. Flow charting

    b. Creating decision tables

4. To be able to write the words FLOW CHART when asked what a given diagram is. The diagram will be a simple flow chart.

5. When given the definition "the graphic representation of what is to be accomplished during the flow of data through a program system", the system is able to respond SYSTEM (MACRO) FLOW CHART.

6. When given the definition "the graphic representation of how various procedures and decisions accomplish the task of the program system," the system is able to respond PROGRAM (MICRO) FLOW CHART.

7. To be able to match...

   a. General/System flow chart with macro

   b. Detailed/Program flow chart with micro

8. To be able to pick from a list the following three advantages that result from the preparation of a program flow chart before coding of a program begins:

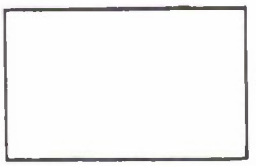
   a. Logical error detection

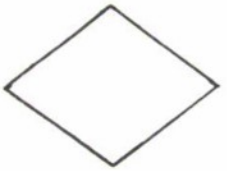
   b. Eases program modifications

   c. Facilitates subdivision of computer programs

9. To be able to match the following symbols on the left with the statement on the right.

a.  Start, stop, halt

b.  Processing

c.  Decision or branch

d.  Connector or step operation

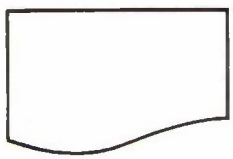
e.  Line of flow

f.  Card read or punch

g.  Magnetic tape operation

h.  Paper tape operation

i.  Direct Access Storage (Disk, Drum, etc.)

j.  Printed document

VII. PROGRAMMING LANGUAGES

1. To be able to define the following abbreviations...

   a. COBOL - Common Business Oriented Language

   b. FORTRAN - Formula Translation

   c. RPG - Report Program Generator

2. To be able to pick out Machine Language from a list when asked, "What is made up of 1's and Ø's?"

3. To be able to supply the term SYMBOLIC CODE when asked what machine specific instructions are used by the Programmer Specialist to represent each machine operation.

4. Identify 'symbolic code' and 'mnemonic operation code' as being the same thing.

5. List the following 5 basic instructional classes.

   a. Arithmetic

   b. Sequence Control

   c. Data Movement

   d. I/O

   e. Comparison

6. Pick out MACRO INSTRUCTIONS when asked what "a single instruction which can accomplish specific functions which actually requires many machine instructions," are called.

7. Can pick out MACHINE ORIENTED LANGUAGE from a list as being 'the programming language in which the programmer uses symbolic coding and macro instructions'.

8. Can pick out ASSEMBLER from a list when asked what converts from symbolic to machine language.

9. Ability to match the following:

   a. Source program - That which is input to the assembler/compiler.

   b. Object deck - The Machine Language Program that is the output of the assembler/compiler.

10. To be able to equate object deck with a loadable application program.

11. To pick PROCEDURE ORIENTED LANGUAGE from a list when confronted with the definition, "a higher order, user oriented language."

12. When presented with the following statements, the student is able to pick the proper language type:

    a. Does not require detailed machine knowledge -Procedure Oriented Language.

    b. Simplifies transfer of programs from computer to computer - Procedure Oriented Language.

c. Easiest for program maintenance and modification - Procedure Oriented Language.

d. Most efficient use of computer storage - Machine Oriented Language.

13. To be able to state that FORTRAN and COBOL are Procedure Oriented Languages.

14. Can pick out COMPILER from a list when asked what converts from a Procedure Oriented Language to a Machine Language.

15. Be able to name the two basic phases of a compiler. They are...

    a. Generator

    b. Translator

16. To be able to match the following:

    a. Generator - Gives Intermediate Language

    b. Translator - Gives Machine Language

17. To select RPG from a list when confronted with the following definition:

VIII. OPERATING SYSTEMS

1. To be able to write OPERATING SYSTEM for the definition 'The Set of Control and I/O Routines which Govern the Initiation and Operation of Programs'.

2. To be able to recognize all of the following...

    a. Application programs of the computer installation.

    b. COBOL compiler

    c. FORTRAN compiler

    d. RPG

    e. UTILITY PROGRAMS

    as being programs which run under the control of an operating system.

3. To be able to pick UTILITY PROGRAMS as routines which function under the control of an operating system and relieve the computer user from writing new routines to perform standard data processing tasks.

4. To be able to identify the following as being examples of Utility Routines:

   a. Sort/Merge

   b. Tape copy

   c. Memory print

   d. Card to tape

5. To correctly match the interaction of the application program with the following:

   a. Operating System - continuously.

   b. Compiler/Assembler - only when must be modified.

   c. Utility Program - only when specific functions are to be accomplished.

6. To match the typical origin of the following programs:

   a. Operating Systems - manufacturer supplied.

   b. Compilers - manufacturer supplied.

   c. Utility Programs - both manufacturer and user supplied.

   d. Application Programs- user supplied.

7. To pick ON-LINE as the use of peripheral equipment or devices in a system in which the operation is under the control of the CPU.

8. To pick OFF-LINE from a list of terms as being the use of peripheral equipment or devices not tied to

9. To be able to write the words BATCH PROCESSING/JOB STACKING when confronted with the definition, 'a stack of jobs that runs one after another.'

10. When asked for the salient feature of the COMPUTER JOB SHOP, the student can pick out the statement, 'took the user away from the computer.'

11. To be able to pick out SUPERVISORY TIME from a list of terms as being when the user has direct contact with his program at the computer.

12. To write TURNAROUND TIME in response to being asked what the minimum amount of time for getting a job in and back is called.

13. To write THROUGHPUT when asked what the amount of computer work accomplished in a given time period.

14. To equate OPERATING EFFICIENCY with the percentage of time the computer is in operation versus the amount of time it is idle due to being set up.

15. Give a list of statements concerning TIME-SHARING/MULTI-PROCESSING, to be able to pick out simultaneous use of a computer by multiple user as being the best statement.

16. To be able to list 3 of the following 6 advantages of time-sharing.

    a. Cost is shared by many users.

    b. Pay only for what you use.

    c. Maximum use is made of the computer.

    d. User brought back to the machine.

    e. Manpower is saved.

    f. Turnaround time reduced for many users.

17. To be able to match the following:

    a. BACKGROUND - programs running in a batch mode under a multi-processing system.

    b. FOREGROUND - those programs that are run in an on-line mode.

18. To be able to identify THIRD GENERATION as the era of industry-wide time-sharing or multi-processing.

19. To be able to pick out the following as being advantageous of third generation computers over those of first or second.

    a. Greater reliability.

    b. More computer power for the same amount of money.

    c. Ability to emulate older machines.

    d. Areas of storage now protected from other users.

IX. INTRODUCTION TO B 3500 SYSTEM

At the completion of Lesson IX, the trainee should be able to:

1. Select MODULAR DESIGN over LIMITED DESIGN as descriptive of the B 3500.

2. Pick from a list of computer generations, the third generation as being descriptive of the B 3500 system.

3. Pick out MULTIPROCESSING from a list as a characteristic of the B 3500 system.

4. Supply the term MCP for the operating system used for the Base Level System.

5. State that the abbreviation MCP stands for Master Control Program.

6. Identify the following as the standard functions of the MCP.

   a. Loading and executing of user programs in a time-sharing environment.

   b. Allocating main memory to programs and relocating user programs when required.

   c. Maintaining disk files.

   d. Providing communication between operator and user via typewriter/keyboard units.

7. Pick FORTRAN and COBOL from a list as the two compilers which are available for the B 3500 system.

8. Pick all of the following as available for the B 3500 system.

   a. Advanced Assembler.

   b. Advanced Sort Generators.

   c. Auxiliary Programs.

9. Indicate CONTROL and DISPLAY as the two types of panels of the Central Processor used by the computer operator.

10. Pick SUPERVISORY PRINTER/KEYBOARD from a list as the device used by the Computer Operator for communication with the MCP.

11. Pick 1ØØK or 15ØK as the amount of bytes of core memory of the BASE LEVEL system depending upon its level.

12. List five pieces of peripheral equipment used in the B 3500 system.

    a. Card Reader.

    b. Card Punch.

    c. Magnetic Tape Units.

    d. Disk Storage Unit (IAS).

    e. Line Printer

13. Pick REMOTE TERMINAL from a list as the way the user communicates with the MCP and programs in a multiprocessing mode.

14. State that arithmetic capability consists of <u>both</u> Fixed Point and Floating Point arithmetic.

15. Pick decimal arithmetic from a list as the arithmetic mode of operation of the B 3500 system.

16. State that in a B 3500 byte there are:

    a. Eight bits.

    b. One character.

    c. Two digits.

17. State that two is the number of bytes which equals one computer word.

18. To match one-half byte with addressing level within memory.

19. Define the following acronyms:

    a. ASCII - American Standard Code for Information Interchange.

    b. BCL - Burroughs Common Language.

20. Match the following:

    a. EBCDIC — 8-bit standard code for representing data within the machine.

    b. ASCII — 7-bit opetional code for representing data.

c. BCL — 6-bit code by which BCD data is encoded on magnetic tape by many other computers, such as the Burroughs B 263.

X. PERIPHERAL EQUIPMENT - LOW DATA RATE

At the completion of lesson 10, the trainee should be able to:

1. Pick 800 CPM as the speed of the Base Level card reader.

2. Pick CARD READER CONTROL UNIT as the peripheral device which controls the card reader.

3. Pick READS COLUMN BY COLUMN BEGINNING WITH 1 from a list, when asked how the card reader interrogates a punched card.

4. Pick 'cannot be varied for a given run' when asked about card length and thickness interchangeability for the card reader and punch.

5. Respond CARD HOPPER, when asked what the part of the card reader is called where cards are loaded.

6. Pick 2400 from a list as the capacity of the reader's hopper.

7. Pick '9's row down, facing in' from a list when asked how cards are placed into the reader.

8. State that a reading station is the place where the A PUNCHED CARD IS INTERROGATED.

9. Pick the term STACKER from a list as referring to an unremoveable tray used for holding cards in the same sequence in which they have been input to the card reader.

10. List the following in sequential order:

    a. Hopper

    b. Reading station

    c. Stacker

11. Pick 2400 from a list as the capacity of the card reader's stacker.

12. Pick from a list 'leftmost card in the stacker' as the last card processed.

13. Type NOT READY as the indicator which lights when any of the three following conditions occur:

    a. Hopper empty.

    b. Stacker full.

    c. Card jam.

14. Respond FEED CHECK when asked what indicator other than NOT READY lights when a card jams.

15. State that START is the only switch which will extinguish the NOT READY indicator for both card reader and punch.

16. State that START is the switch which allows the card reader to read cards under control of the B 3500.

17. State that STOP is the switch which keeps the card reader from feeding cards.

18. State that READ CHECK is the indicator which lights when read check circuitry detects an operational failure.

19. Pick 'attempting to read in an incorrect mode' and 'put card in reader incorrectly'. From a list as the kind of reading errors that will cause the illusion of a validity check indication.

20. Respond VALIDITY ON as the switch which must be depressed prior to the possible indication of an invalid character read via the validity check indicator.

21. Pick 'none of the above' from a list of erroneous uses of the END OF FILE switch/indicator.

22. State that RESET is the switch which clears all error indicators on the card reader.

23. Pick '300' as the CPM of the card punch.

24. Pick '500' from a list, as being the number of cards held by the hopper of the card punch.

25. Pick '12 edge down in' from a list as the correct placement of cards into the card punch.

26. State the FOLLOW BLOCK is the device that is placed on top of the cards in the hopper to ensure proper feeding.

27. State that PUNCH STATION is where the card is held until it is punched.

28. List the three types of stackers:

    a. Primary

    b. Error

    c. Auxiliary

29. Pick ERROR STACKER from a list as the place where blank cards are forced that have been too long in the punch station.

30. Pick from a list 'there is no effect' when asked what happens when cards are removed from the stacker during a card punch operation.

31. State that START is the switch which causes one card to move from the hopper to the punch station.

32. Type NOT READY as the indicator which lights when any of the following conditions occur:

    a. No card is punch station.

    b. Punch error.

    c. Any of the stakers full.

    d. Stop button has been pushed.

33. State that FEED CHECK is the indicator (in addition to NOT READY) which lights when there is no card in the punch station as a result of a failure to feed or a card jam.

34. State that PUNCH CHECK (in addition to NOT READY) is the indicator which lights when data, that should have been punched on a card, are omitted.

35. State that RESET is the switch which clears the feed check and punch check error conditions.

36. Supply the term RUNOUT when asked to name the switch which causes cards to pass through the card punch without being punched.

37. Pick 11ØØ from a list as being the LPM of the 9245 line printer due to the high-speed slew.

38. Pick '132' from a list as being the number of print positions of the line printer.

39. Pick PAPER from a list as being most closely related to FORM.

40. Pick 'tape interchangeability, controls feeding operations, and controls spacing operations,' from a list as characteristics of the line printer's control tape.

41. State that NOT READY is the indicator which will light after any of the following conditions:

    a. End of paper.

    b. The pushing of the not ready button.

    c. Paper slews for more than one second.

42. Pick 'causes the carriage to skip to the 1st punch in channel 1 of the carriage control tape' from a list as the result of pushing the SKIP TO HEADING SWITCH.

43. State that end of paper is the indicator that is reset by pressing the ready switch.

44. Pick from a list 'increases operator efficiency' as the purpose for duplicate switches and indicators at the rear of the printer.

XI. PERIPHERAL EQUIPMENT - HIGH DATA RATE

At the completion of lesson 11, the trainee should be able to:

1. State that the abbreviation MTU stands for Magnetic Tape Unit.

2. Pick from a list FREE STANDING and CLUSTERED as the two types of units available for the B 3500 system.

3. Supply the word TAKE-UP in response to being asked what the permanently located reel on the left-hand side of the free standing MTU is called.

4. State that SUPPLY or FEED is the reel which is mounted on the right-hand side of the free standing MTU.

5. Pick from a list the following as characteristic of clustered tape reels.

    a. Supply reel is mounted directly above the take-up reel.

    b. Take-up reel is permanently timed to accommodate tape feeding.

6. Pick all of the following as constituting that which could be found on a supply reel.

   a. Input data for a program.

   b. Blank tape - intermediary.

   c. Blank tape - to contain an output.

   d. Programs to be executed.

7. Pick from a list 8½" and 1Ø" as the reel sizes for the Base Level tape units.

8. State RING to identify the plastic device placed into the back of a tape reel which allows new information to be written onto a tape.

9. Respond LOAD POINT to identify the reflective marker placed on the tape at the beginning of a reel which signals where reading or writing starts.

10. Pick END OF TAPE MARKER from a list as the reflective marker which signals the end of tape.

11. Pick 9Ø IPS from a list as the normal drive speed of a FREE STANDING tape unit.

12. Pick 3ØØ IPS from a list as the average high speed rewind speed of a FREE STANDING tape unit.

13. Pick EITHER DIRECTION from a list as the method for reading a tape.

14. Pick from a list the steps for loading a FREE STANDING tape and order them in the following sequence:

   a. Pull down glass door.

   b. Place reel onto feed hub.

   c. Snap down reel latch on hub.

   d. Connect end of tape to end of leader.

   e. Position follower arm.

   f. Push up glass door.

15. Pick UNIT DESIGNATOR as the leftmost indicator on the control panel.

16. State that LOAD is the switch which causes the tape to be drawn into the vacuum columns and moved from left to right so that the beginning of the tape is at the read/write heads.

17. State that UNLOAD is the switch that repositions the tape from load point to the beginning of the latch leader.

18. State that REWIND causes the tape to move from right to left so that the beginning of tape is at the read/write heads.

19. State that LOCAL is the switch which removes the tape unit from control of the B 3500 system.

20. State that REMOTE is the switch which places the tape unit under control of the B 3500 system.

21. Pick from a list 'Supply Reel has a ring and can be written upon' as being descriptive of the WRITE RING indicator.

22. Match DENSITY with the selector in the rightmost position of the MTU control panel.

23. Pick from a list LOCAL-LOAD-REMOTE as the correct sequence of button actions when loading a tape and placing it under control of the B 3500 system.

24. Pick from a list LOCAL-REWIND as the correct sequence of button actions taken when rewinding a tape.

25. Pick from a list LOCAL-UNLOAD as the correct sequence of button actions taken when unloading a tape after the tape has been rewound.

26. Define DFEU as standing for Disk File Electronics Unit.

27. Pick from a list DISK FILE MODULES as the storage units which are controlled by the DFEU.

28. Supply the terms MASTER and DISK when asked what the two kinds of write lockouts are.

29. Pick 'the absence of a write ring' as most analogous to a write lockout condition on a disk unit.

30. State that NOT READY is the indicator which lights when any of the following conditions occur:

    a. Air pressure low.

    b. AC power off.

    c. DC power off.

    d. All disks not up to speed.

31. Pick from a list NONREMOVEABILITY as a characteristic of the disks of a disk file module.

32. Pick 1Ø,ØØØ,ØØØ as the byte capacity of a disk file module.

33. Respond SEGMENT when asked what element of a disk module contains 1ØØ bytes of data.

34. Respond TRACK when asked what element of a disk module contains 25Ø segments.

35. Respond DISK when asked what constitutes 1ØØ tracks.

36. Identify four as the number of disks contained in a disk file module.

37. State that SYSTEM DISK and USERS DISK are the two categories into which disk storage is divided.

38. Pick from a list MCP and the MCP TABLES/DIRECTORIES as comprising the SYSTEM DISK.

39. Pick from a list programs, data files, and compilers as the contents of the USER'S DISK.

40. State that FILES are related records which are treated by the user as being contiguous on the disk.

41. State that TEMPORARY describes files which are normally used by a single program on a given run.

42. State that PERMANENT describes files which may be used from job-to-job, or day-to-day.

XII. OPERATOR'S CONSOLE AND SUPERVISORY PRINTER/KEYBOARD - 9340

At the completion of lesson 12, the trainee should be able to:

1. Define the acronym SPO as Supervisory Printer On-line.

Match the following:

2. ENQ - A signal to the MCP that the operator wishes to input a message.

3. ETX - End of transmission.

4. NAK - Reset the entire line of this message.

5. CTRL - Must be depressed in conjunction with special coded keys when they are to be used.

6. PICK CTRL/ENQ from a list as describing the START operation.

7. Pick from a list in the proper order the following ERASE operations:

   a. CTRL/NAK.

   b. Retype the entire message.

8. Pick from a list CTRL/ETX as the operation to TERMINATE a message.

9. Respond NIXIE TUBE when asked what the equipment is called which allows for the display presentation of two groups of six digits each.

10. Respond DIGITS when asked what the symbols $\emptyset$ through 9 are termed.

11. Respond UNDIGITS when asked what the symbols $\overline{\emptyset}$ through $\overline{5}$ are termed.

12. Respond Hexadecimal as the number system which is equivalent to the extended number sets undigits $\overline{\emptyset}$ through $\overline{5}$ and the digits $\emptyset$ through 9.

13. Pick from a list:

    a. OP AF BF.

    b. Program address.

    c. Memory Address.

    ...as that which can be displayed in the left group of the Nixie tube.

14. Pick from a list:

    a. Instruction address.

    b. Memory information.

    c. Base (register) Limit (register).

    ...as that which can be displayed in the right group of the Nixie tube.

15. Pick from a list 'channel is busy' when asked what is meant by illumination of a channel indicator.

Match the following fixed message displays:

16. NORMAL - Not in a control state operation

17. ASCII - Indicates the processor is not operating on EBCDIC data.

18. INTERRUPT - Logical interrupt not completed.

19. PROGRAM - Invalid operation, address, or instruction time out interrupt.

20. CHECK - Results from a parity interrupt.

21. OVERFLOW - Can be caused by an invalid arithmetic operation.

22. TEST - Lights each time the operator initiates the system from the start.

23. Pick from a list 'the keys which represent the digits Ø - 9 and undigits $\bar{Ø}$ - $\bar{5}$' as those which comprise the INFORMATION entry keys.

24. Give the correct meaning of these abbreviations:

    a. CL - Clear

    b. LD - Load

    c. PA - Program Address.

    d. AD - Address.

    e. WR - Write

    f. SI - Single In

25. State READ when asked the name of the control key which permits the display of one to four digits starting at the memory address specified.

26. State WRITE when asked the name of the control key which permits the entering of information into core memory one digit at a time starting at the memory address specified.

27. State SKIP when asked the name of the control key which allows the bypass of a digit position when entering information into core memory.

28. State that STOP/RUN is the key which:

    a. Stops the processor, or

    b. Causes the processor to continue execution of the stopped program.

29. State that SINGLE IN is the key which causes the current instruction displayed in the Nixie tube to be executed and the next instruction fetched and displayed.

Match the following:

30. OP - Causes the current instruction and its address to be displayed in the Nixie tube.

31. A,B,C - Causes the corresponding address field (A, B, or C) of an instruction to be displayed in the right group of the Nixie tube.

32. PA - Allows the address of the next instruction to be displayed in the Nixie tube and changed if desired.

33. AD - Used in conjunction with the read and write key to specify the location of the core memory address to be read or written.

34. State that TERM functions the same as the clear keys except all I/O operations are stopped.

35. Pick STOP/RUN from a list as the only key which is active whether or not the processor is halted.

36. State that UNIVERSAL is the type of load which is used when the operator selects the channel and peripheral unit from which to load the system loader deck.

37. State that NORMAL is the other type of load.

38. Pick from a list and order the following keyboard actions which are necessary for a NORMAL LOAD.

    a. CL

    b. LD

39. Pick from a list and order the following keyboard actions which are necessary for a UNIVERSAL LOAD.

    a. CL

    b. AD

    c. WR

    d. Enter channel number and I/O descriptor digits.

    e. OP and the digits 660000.

    f. STOP/RUN

XIII. SYSTEM SOFTWARE AND INTERVENTION - PART 1

At the completion of lesson 13, Part 1, the trainee should be able to: Match the following definitions:

1.	Disk Directory Table	-	Contains the absolute disk address and length of any program/data file that is a permanent file within the system.
2.	Scratch	-	A magnetic tape that does not contain data relevant to any program and is therefore available as a storage medium.
3.	Breakout	-	The interruption of processing of a given program.
4.	System Log	-	The table maintained by the MCP which contains all data relevant to management of the computing center.
5.	File opening	-	A function required of programs before any data within a file may be accessed.

6. Select the following from a list as the three prerequisites to B 3500 operation:

   a. MCP must be on disk.

   b. The Disk Directory Table must be on disk.

   c. The computer configuration must be detailed for use by the MCP.

7. Select SIMPLE and COLD START as the two types of System Loaders that may be used to enable B 3500 operation.

8. Select from a list the conditions which require the COLD START Loader to be used:

   a. Neither the MCP nor the Disk Directory Table exist on disk.

   b. The Disk Directory Table is to be wiped out.

9. State that the SIMPLE LOADER is used only when a different version of the MCP is to operate with the existing Disk Directory Table.

10. State that 'an illegal character in column one' is the method by which the MCP recognizes a control card.

11. Select from a list in the correct sequence the following control cards required by the SIMPLE loader:

    a. System tape specifier card.

    b. Keyboard SPO channel card.

    c. Disk specification card.

    d. MCP version card.

12. Select from a list those required, and optional control cards used as input to the COLD START Loader. The correct cards are:

    a. System tape specifier card.

    b. Data card.

    c. MCP version card.

    d. Channel cards (include keyboard SPO channel card).

    e. Unit cards.

f. Disk specification cards.

g. Load card.

h. Parameter and use (option) cards.

i. File card groups.

j. Stop card.

Match the System Loader Control Cards with their uses:

13. System Tape Specifier card - Specifies the location of the 'SYSTEM' tape.

14. Keyboard SPO channel card - Specifies the channel to which the Keyboard SPO is attached.

15. Unit card - Specifies the peripheral devices and their locations for use by the MCP.

16. Disk Specification card - Specifies the number of disk electronic units and their address ranges for use by the MCP.

17. Date card - Sets the date used by the MCP.

18. Use BOJ card - Causes the MCP to print on the operator console a beginning-of-job message for each initiated program.

19. Use EOJ card - Causes the MCP to print on the operator console an end-of-job message for each program that completes execution.

20. Use LOG card - Notifies the MCP that maintenance of the system log is required.

21. Use OPN card - Causes the MCP to print on the operator console a file open message each time a file is opened.

22. Use date card - Causes the MCP to request the date at each halt/load.

23. Use time card - Causes the MCP to request the time of day at each halt/load.

24. Use LIB card - Causes the MCP to type on the SPO the library maintenance actions.

25. Use PBT card - Causes the MCP to use a printer back-up tape if the line printer is not available.

26. Use Auto card - Causes the printer backup files to be automatically printed when the file is released by the program and a line printer is available.

27. MCP Specifier card - Informs the MCP loader which MCP version to load onto disk.

28. Load card - Causes the MCP to be loaded into core.

29. Stop card - The last card of a Cold Start System Loader Control Deck.

Match the Program Control Cards with their uses:

30. Compile card - Identifies the translator (COBOL, FORTRAN) used to compile a source program and the type of compile to be made.

31. Execute card - Calls a library program (permanent file) from disk for execution.

32. Remove card - Causes files specified to be erased from the Disk Directory Table.

33. Dump card - Causes one or more programs and/or data files to be copied onto a scratch tape from disk.

34. Load card - Causes files named on the card to be loaded onto disk and entered in the Disk Directory Table.

35. Change card - Causes the program and/or data file names to be changed.

36. Label card - Relates a card file with a data file name and other information.

37. Data card - Relates a card file with a data file name only.

38. Restart card - Causes the restart of a program from the breakout or interrupted point.

39. Unit card - Causes the introduction of peripheral devices into the environment of the MCP.

40. End card - Denotes the end-of-file for a given card file.

41. Pick from a list the following five program parameter cards:

    a. Priority card - Assigns a priority value to the program.

    b. File card - Associates a data file name to the program.

    c. Core change card - Modifies core requirements of a library program after scheduling.

    d. Value card - Allows assignment of a 6-digit value at execution time to an address in the program's core area.

    e. Charge card - Assigns a charge number to log records of the program.

42. Identify the following program control and parameter cards in the proper order.

    a. Compile or Execute card.

    b. Program parameter cards (if any).

    c. Program control cards in any sequence.

XIII. SYSTEM SOFTWARE AND INTERVENTION - PART 2

At the completion of Lesson 13, Part 2, the trainee should be able to:

1. State that those output messages preceded by '**' require operator action.

2. State that those output messages proceeded by '--' signal the discontinuation of the program.

3. Type 'state of processing' as those output messages not prefixed by '**' or '--'.

4. Select from a list the following three classifications as being the major categories of messages output to the System Operator by the MCP.

   a. Errors.

   b. Requirements.

   c. Results.

5. Pick all of the following as constituting the types of error conditions output by the MCP.

   a. Hardware errors.

   b. Data errors.

   c. Program errors.

6. When informed 'peripheral' is one type of requirement communicated to the operator by the MCP, indicate 'data' are the second.

7. Select all of the following as System Operator/program functions to which the MCP responds with result messages.

   a. Input query messages.

   b. Input commands.

   c. Options set by a Program Control Card or the System Operator.

8. Select 'at system load time or anytime thereafter' from several alternatives as when data can be introduced into the system.

9. Pick from a list the following as the three methods of introducing data into the system.

   a. Card files in the card reader.

   b. Pseudo Card Decks

   c. SPO input messages.

10. Select 'object program' and 'System Operator' as the two ways in which a job may be scheduled for operation.

11. Complete the sentence 'Pseudo Card Readers' enable the MCP to read data from disk and process it as if the data were in a CARD READER.

12. State that the maximum number of Pseudo Card Readers is nine.

13. Respond JRT or Job Reference Table when asked where the schedule of jobs waiting to be executed is maintained.

14. Respond 'Mix' when asked where the information relevant to a job being executed by the MCP and associated tables is maintained.

15. Respond '10' and '40' when asked what is the maximum number of jobs that can be in the mix and schedule, respectively.

16. Respond 'precedence link' when asked what is the feature that permits the scheduling of a second program after the first program is completed.

17. State that the 'execute card' is the means of using the precedence link feature of the MCP.

18. Select '? EXECUTE (Program-Name) AFTER (Program-Name)' from a list as being the correct control card to schedule one program followed by another.

19. State 'CC' as preceeding the SPO input message that allows the System Operator to supply control information to the MCP.

20. Respond 'LD" when asked what message permits the System Operator to initiate the on-site load control program.

21. State 'OL' when asked what is the message that prints the status of all units on the channel indicated including Pseudo Card Readers.

22. Pick 'RD' as the message that is used to remove control decks from disk.

23. Supply 'RN' when asked what is the message used to indicate the number of Pseudo Card Readers needed.

24. State that system options:

    a. May be caused to function both by System Loader Control Cards and by SPO input messages and

    b. May be enabled or disabled anytime after system load via SPO input messages.

25. State 'TO' when asked what is the message used by the System Operator to request the typing of the status of the system options.

26. Respond 'SO' when asked what message is used by the System Operator to set system options.

27. Pick 'RO' as the message used to reset specified system options.

28. Complete the sentence 'if the operator ignores the LOG FILE FULL message, the accumulated information will be LOST or PURGED.'

29. Supply 'LN' when asked what is the message that will cause the LOG file to be scheduled for printing by the program LOGGER (or by program LOGOUT in case LOGGER is not available).

30. Respond 'Mix index' when asked what is the pointer to a program that is used by the MCP to associate SPO input messages.

31. State the 'MX' message causes the MCP to supply the operator with the mix index of all programs in the Mix Table.

32. Respond 'BK' when asked what message is used to interrupt or breakout a given program, based on the occurrence of specified conditions.

33. Pick 'BR' as the message that is used to interrupt or breakout a program unconditionally.

34. Respond 'RB' when asked what message is used to restart a program interrupted either conditionally with the 'BK' or unconditionally with the 'BR' input message.

35. Match the interruption and suspension of programs with the resulting action:

    a. Interrupted - The program is removed from the system and placed on a restart tape.

    b. Suspended - The program is removed from core and placed on disk until reinstated.

36. State that 'ST' is the message used to temporarily suspend a program by the System Operator.

37. State a program can be temporarily 'suspended' when any one of the following conditions occur:

    a. No file available.

    b. Duplicate files.

    c. No user disk.

    d. Duplicate library.

38. State that the 'OK' message is used to direct the MCP to continue program processing after it has been temporarily suspended due to MCP action.

39. State that the 'GO' message is used to reinstate a program suspended by the 'ST' message.

40. Supply 'DS' when asked what message allows the System Operator to terminate a program.

41. State that the 'WS' message is used to request a list of those programs which are scheduled for execution by the MCP, but have not been loaded or initiated.

42. Respond 'RS' when asked what message allows the System Operator to remove a schedule request for a program before it is initiated.

43. Select from a list the following possible indications of program failure:

    a. Repeated output messages.

    b. Opening and closing the same files.

    c. Exceeding the time required for execution.

44. State the 'DM' message causes a memory dump of the specified program to be output to the line printer and the program to continue processing.

45. State the 'DP' message causes a memory dump to be listed on the line printer and the program to terminate.

46. State the 'GT' message causes a trace of the object program as an aid to programmers in discovering program errors.

47. State the 'NT' message discontinues the trace.

EXAMPLE OF LESSON MATERIAL FROM THE COURSE DESIGNER/TRAINEE VIEWPOINT

The following example is extracted from Lesson 2 - Number Systems as executed by a trainee during the Phase II validation activity conducted at the STTC.

The lesson as constructed by the course designer is presented on the left side of each page whereas the lesson as executed by the trainee is presented on the right side of each page.

The example selected depicts a trainee who elected to take the pre-requisite test in an attempt to by-pass the lesson. After several frames, the program informs him that he has FAILED to pass this test. He is automatically branched to the start of the lesson and continues lesson execution from that point. Several more frames have been included to indicate his path through the lesson.

```
FRAME    1.0  TYPE M1  LABEL C00200

G.2 TEXT
  1.0                        II.  NUMBER SYSTEMS??
  2.0  DO YOU WISH TO TAKE THIS LESSON ON NUMBER SYSTEMS OR DO YOU ALREADY
  3.0  KNOW THE MATERIAL?

G.3 ANSWERS
  1.0  A+YES, I'LL TAKE IT.
  2.0  B+NO, I KNOW IT.

G.4 ACTIONS
  1.0  A F:O.K. B:MOD2
  2.0  B F:O.K., LET'S MAKE SURE.


FRAME    2.0  TYPE Q1  LABEL

G.2 TEXT
  1.0  THE BASE OF A NUMBER SYSTEM IS DEFINED AS . . .

G.3 ANSWERS
  1.0  O SET KEYWORD ON
  2.0  O SET PHONETIC ON
  3.0  A+NUMBER SYMBOLS
  4.0  B+NUMBER DIFFERENT
  5.0  C+TOTAL SYMBOLS
  6.0  D+TOTAL DIFFERENT


FRAME    3.0  TYPE Q1  LABEL

G.2 TEXT
  1.0  7 IS THE ---------- OF 4 AND 3.

G.3 ANSWERS
  1.0  O SET ORDER ON
  2.0  A+SUM
  3.0  B+ADDITION
```

II. NUMBER SYSTEMS

DO YOU WISH TO TAKE THIS LESSON ON NUMBER SYSTEMS OR DO YOU ALREADY KNOW THE MATERIAL?
A YES, I'LL TAKE IT.
B NO, I KNOW IT.
*.
b
O.K., LET'S MAKE SURE.
THE BASE OF A NUMBER SYSTEM IS DEFINED AS . . .
*.
the value of the second digit
7 IS THE ---------- OF 4 AND 3.
*.
sumsum

```
FRAME   4.0  TYPE Q1  LABEL

G.2 TEXT
  1.0  12 IS THE --------- OF 4 AND 3.

G.3 ANSWERS
  1.0  A+PRODUCT


FRAME   5.0  TYPE Q1  LABEL

G.2 TEXT
  1.0        (WE WILL USE THE ASTERISK '*' TO INDICATE MULTIPLICATION)?
  2.0  IN THE EXPRESSION: 4*3*2=24, THE NUMBERS 4, 3, AND 2 ARE CALLED
  3.0  ----------.

G.3 ANSWERS
  1.0  A+FACTORS
  2.0  A+FACTOR


FRAME   6.0  TYPE M1  LABEL

G.2 TEXT
  1.0  WHAT IS THE NTH POWER OF THE NUMBER B?

G.3 ANSWERS
  1.0  A+  B MULTIPLIED BY ITSELF N TIMES.
  2.0  B   N MULTIPLIED BY ITSELF B TIMES.
  3.0  C   B ADDED TO N.
  4.0  D   B TIMES N.


FRAME   7.0  TYPE Q1  LABEL

G.2 TEXT
  1.0  IN AN EXPRESSION WHICH RAISES B TO THE NTH POWER, 'B' IS KNOWN AS
  2.0  THE ---------- AND 'N' AS ITS ----------.

G.3 ANSWERS
  1.0  D ORDER OFF
  2.0  A+BASE EXPONENT
  3.0  B+BASE POWER
```

12 IS THE --------- OF 4 AND 3.
product*.
product
(WE WILL USE THE ASTERISK '*' TO INDICATE MULTIPLICATION)

IN THE EXPRESSION: 4*3*2=24, THE NUMBERS 4, 3, AND 2 ARE CALLED
----------.
*.
terms
WHAT IS THE NTH POWER OF THE NUMBER B?
A B MULTIPLIED BY ITSELF N TIMES.
B N MULTIPLIED BY ITSELF B TIMES.
C B ADDED TO N.
D B TIMES N.
*.
aa
IN AN EXPRESSION WHICH RAISES B TO THE NTH POWER, 'B' IS KNOWN AS
THE ---------- AND 'N' AS ITS ----------.
*.
number number power

```
FRAME  37.2  TYPE D1  LABEL NOGO2

G.2 CONDITIONS
  1.0  F:YOU HAVE MISSED TOO MANY KEY ITEMS SO FAR, THEREFORE, THE PRE-
  2.0  F:REQUISITE TEST WILL BE TERMINATED AND THE COURSE MATERIAL ON
  3.0  F:NUMBER SYSTEMS PRESENTED.


FRAME  38.0  TYPE Q1  LABEL MOD2

G.2 TEXT
  1.0                          II  NUMBER SYSTEMS??
  2.0  CIVILIZED MAN NO LONGER COUNTS THINGS BY PUSHING OBJECTS AROUND.
  3.0  INSTEAD HE PUSHES AROUND 'SYMBOLS' OR NUMBERS WHICH STAND FOR OBJECTS.?
  4.0  CIVILIZED COMPUTERS ALSO MANIPULATE ---------- RATHER THAN THINGS.


FRAME  38.5  TYPE Q1  LABEL

G.3 ANSWERS
  1.0  0 SET PHONETIC ON
  2.0  0 SET ORDER ON
  3.0  0 SET KEYWORD ON
  4.0  0+SYMBOLS
  5.0  A+NUMBERS

G.4 ACTIONS
  1.0  AR F:
  2.0  -F:NOTICE THE 'ALSO'. C:


FRAME  39.0  TYPE Q1  LABEL

G.2 TEXT
  1.0  THE SYMBOLS USED IN VARIOUS NUMBER SYSTEMS ARE ARBITRARY IN THAT THEY
  2.0  ARE MAN-MADE FOR OUR CONVENIENCE.?
  3.0  NUMBER SYSTEMS ARE MADE UP OF ARBITARY ----------.

G.3 ANSWERS
  1.0  A+SYMBOLS

G.4 ACTIONS
  1.0  A F:
  2.0  -C:
```

YOU HAVE MISSED TOO MANY KEY ITEMS SO FAR, THEREFORE, THE PREREQUISITE TEST WILL BE TERMINATED AND THE COURSE MATERIAL ON NUMBER SYSTEMS PRESENTED.

II NUMBER SYSTEMS

CIVILIZED MAN NO LONGER COUNTS THINGS BY PUSHING OBJECTS AROUND. INSTEAD HE PUSHES AROUND 'SYMBOLS' OR NUMBERS WHICH STAND FOR OBJECTS.

CIVILIZED COMPUTERS ALSO MANIPULATE ---------- RATHER THAN THINGS.

*.
symbols
CORRECT
THE SYMBOLS USED IN VARIOUS NUMBER SYSTEMS ARE ARBITRARY IN THAT THEY ARE MAN-MADE FOR OUR CONVENIENCE.

NUMBER SYSTEMS ARE MADE UP OF ARBITARY ----------.

*.
symbols
TRUE

```
FRAME  40.0  TYPE Q1  LABEL

G.2 TEXT
  1.0  IN SCHOOL WE LEARNED COUNTING AND ARITHMETIC WITHIN THE USUAL
  2.0  DECIMAL NUMBER SYSTEM.  WE WERE ACQUAINTED ALSO WITH SYMBOLS LIKE
  3.0  I, II, III, IV, ETC., WHICH IN CAESAR'S TIME CONSTITUTED THE
  4.0  ---------- NUMERICAL SYSTEM.

G.3 ANSWERS
  1.0  A+ROMAN

G.4 ACTIONS
  1.0  A F:
  2.0  -C:


FRAME  41.0  TYPE Q1  LABEL

G.2 TEXT
  1.0  OUR FAMILIAR NUMBERING SYSTEM USES THE TEN SYMBOLS?
  2.0        0 1 2 3 4 5 6 7 8 9.?
  3.0  IT IS CALLED THE ---------- NUMBER SYSTEM.

G.3 ANSWERS
  1.0  A+DECIMAL
  2.0  B+ARABIC

G.4 ACTIONS
  1.0  A F:
  2.0  B F:ARABIC IS FINE BUT WE WERE THINKING OF DECIMAL.
  3.0  -C:


FRAME  42.0  TYPE Q1  LABEL BASE

G.2 TEXT
  1.0  WE REFER TO THE TOTAL NUMBER OF DIFFERENT SYMBOLS IN A NUMBERING
  2.0  SYSTEM AS THE 'BASE' OF THAT NUMBER SYSTEM.?
  3.0  THE DECIMAL NUMBERING SYSTEM IS 'BASE 10' BECAUSE IT CONTAINS A
  4.0  TOTAL OF 10 DIFFERENT ----------.

G.3 ANSWERS
  1.0  0 SET PHONETIC ON
  2.0  0 SET ORDER ON
  3.0  0 SET KEYWORD ON
  4.0  A+SYMBOLS

G.4 ACTIONS
  1.0  A F:
  2.0  -R:
  3.0  -C:
```

IN SCHOOL WE LEARNED COUNTING AND ARITHMETIC WITHIN THE USUAL DECIMAL NUMBER SYSTEM. WE WERE ACQUAINTED ALSO WITH SYMBOLS LIKE I, II, III, IV, ETC., WHICH IN CAESAR'S TIME CONSTITUTED THE ---------- NUMERICAL SYSTEM.

*.

roman

GOOD

OUR FAMILIAR NUMBERING SYSTEM USES THE TEN SYMBOLS

Ø 1 2 3 4 5 6 7 8 9.

IT IS CALLED THE ---------- NUMBER SYSTEM.

*.

decimaldecimal

CORRECT

WE REFER TO THE TOTAL NUMBER OF DIFFERENT SYMBOLS IN A NUMBERING SYSTEM AS THE 'BASE' OF THAT NUMBER SYSTEM.

THE DECIMAL NUMBERING SYSTEM IS 'BASE 1Ø' BECAUSE IT CONTAINS A TOTAL OF 1Ø DIFFERENT ----------.

*.

symbols

GOOD

```
FRAME  43.0  TYPE Q1  LABEL

G.2 TEXT
  1.0  WE CALL THIS NUMBER SYSTEM DECIMAL NOT BECAUSE IT HAS 'DECIMAL POINTS'
  2.0  BUT BECAUSE DECIMAL COMES FROM A LATIN WORD MEANING TEN.  THE DECIMAL
  3.0  SYSTEM HAS A BASE OF -----.  (NUMBERS ARE THE PREFERRED RESPONSE).

G.3 ANSWERS
  1.0  B+10
  2.0  A+TEN

G.4 ACTIONS
  1.0  AB F:
  2.0  -C:


FRAME  44.0  TYPE Q1  LABEL

G.2 TEXT
  1.0  THE 'BASE' OF A NUMBER SYSTEM IS DEFINED AS THE TOTAL ---------- OF
  2.0  DIFFERENT ---------- USED IN THAT NUMBER SYSTEM.

G.3 ANSWERS
  1.0  D ORDER OFF
  2.0  A+NUMBER SYMBOLS

G.4 ACTIONS
  1.0  A F:
  2.0  -B:
  3.0  -C:


FRAME  45.0  TYPE Q1  LABEL

G.2 TEXT
  1.0  NOTICE THAT ALTHOUGH 9 IS THE HIGHEST ELEMENTARY NUMBER IN THE DECIMAL
  2.0  SYSTEM, THERE ARE ACTUALLY 'TEN' DIFFERENT SYMBOLS SINCE WE MUST
  3.0  ALWAYS INCLUDE ---------- AS A SYMBOL IN ITS OWN RIGHT.

G.3 ANSWERS
  1.0  D PHONETIC OFF
  2.0  B+0
  3.0  A+ZERO
  4.0  C 10
  5.0  D TEN

G.4 ACTIONS
  1.0  AB F:
  2.0  CD F:LOOK AT THE DECIMAL SYMBOLS AGAIN STARTING WITH 'ZERO' AND
  3.0  B:TRY AGAIN.
  4.0  -C:
```

WE CALL THIS NUMBER SYSTEM DECIMAL NOT BECAUSE IT HAS 'DECIMAL POINTS' BUT BECAUSE DECIMAL COMES FROM A LATIN WORD MEANING TEN. THE DECIMAL SYSTEM HAS A BASE OF -------. (DIGITS ARE THE PREFERRED RESPONSE)

*.

1Ø

CORRECT

THE 'BASE' OF A NUMBER SYSTEM IS DEFINED AS THE TOTAL ---------- OF DIFFERENT ---------- USED IN THAT NUMBER SYSTEM.

*.

number symbolsTRUE

NOTICE THAT ALTHOUGH 9 IS THE HIGHEST ELEMENTARY NUMBER IN THE DECIMAL SYSTEM, THERE ARE ACTUALLY 'TEN' DIFFERENT SYMBOLS SINCE WE MUST ALWAYS INCLUDE ---------- AS A SYMBOL IN ITS OWN RIGHT.

*.

Ø

FINE

APPENDIX III

PHASE I AND II DATA ANALYSIS, USAF APTITUDE TEST SCORES AND SAMPLE DATA COLLECTION FORMS

The detailed analysis performed on the data collected during the Phase I and II validation activity is presented. In addition, the USAF aptitude test scores on all participating trainees is provided. Finally, samples of forms provided to the trainees for recording pertinent data is included.

TABLE 4 - USAF Aptitude Test Scores (Sheet 1 of 2)

Phase I

TRAINEE DESIGNATOR	EDPT	GENERAL	ADMINISTRATIVE	MECHANICAL	ELECTRONIC	AFQT
1	68	60	70	60	70	89
2	74	80	65	80	75	74
3	85	75	80	60	75	78
4	57	75	95	60	80	63
5	64	80	85	60	65	74
6	60	85	95	90	85	94

Comments

PHASE I Validation for the Computer Operator's Training Module was conducted at Sheppard AFB from 4 March through 24 March 1969.

Six airmen served as trainees for this GIVE (Group - Individual Validation Environment) phase.

TABLE 4 - USAF Aptitude Test Scores (Sheet 2 of 2)

Phase II

TRAINEE DESIGNATOR	EDPT	GENERAL	ADMINISTRATOR	MECHANICAL	ELECTRONIC	AFQT
1	71	95	95	90	95	72
2	73	70	95	50	70	78
3	72	90	95	80	95	52
4	75	95	90	90	95	76
5	77	90	95	75	90	81
6	83	70	85	35	60	91
7	73	95	95	85	95	70
8	72	95	90	95	95	93
9	75	85	95	25	60	95
10	85	85	85	65	90	91
11	72	75	70	50	70	82
12	74	95	85	90	95	98

Comments

Phase II Validation for the Computer Operator's Training Module was conducted at Sheppard AFB from 28 April through 19 May 1969.

Twelve Airmen served as the trainees for this field test in a simulated classroom environment.

TABLE 5 - Lesson Execution Effective Time - Phase I (Sheet 1 of 2)

LSN	BODY + REVIEW SHORT	BODY + REVIEW LONG	BODY + REVIEW M	TEST SHORT	TEST LONG	TEST M	SUB TOTALS SHORT	SUB TOTALS LONG	SUB TOTALS M
1	1:30	2:03	1:47	*1:16	*1:22	1:19*	2:49	3:22	3:06
2	2:10	3:30	2:34	:47	1;03	:55**	3:10	4:25	3:29
3	1:10	1:53	1:31	1:05	1:09	1:07**	2:17	3:00	2:38
4	:47	1:36	1:12	:45	1:04	:52	1:32	2:23	2:04
5	1:17	3:06	1:53	:22	1:02	:46	2:01	3:52	2:39
6	:17	:53	:38	:16	:30	:23	:42	1:20	1:01
7	1:18	2:40	1:45	:43	1:13	1:01	2:22	3:41	2:46
8	1:28	2:51	2:05	:52	1:35	1:11	2:20	3:46	3:16
9	:59	1:08	1:04	:13	1:04	:36	1:21	2:03	1:40
10-1	1:41	2:35	2:03	:29	1:33	1:05	2:01	3:22	3:08
10-2	:23	:37	:31	:04	:37	:14	:34	1:09	:45
11	1:08	2:13	1:53	:16	1:35	1:00	2:03	3:50	2:53
12-1	:31	1:36	:52	:10	:23	:15	:43	1:46	1:07
12-2	1:29	2:23	1:54	:44	2:59	1:26	2:35	4:45	3:20
13-1	1:14	2:07	1:50	:20	:33	:34	1:47	2:47	2:24
13-2	1:06	1:47	1:25	:34	1:15	:46	1:40	2:29	2:11
13-3	1:20	2:02	1:43	:15	:21	:18	1:35	2:22	2:01
13-4	1:46	2:56	2:05	:14	1:05	:29	2:00	4:01	2:34
13-5	1:54	2:14	2:02	:10	:43	:26	2:02	2:45	2:28
	23:28	40:10	30:47	9:35	21:06	14:43	35:34	57:08	45:30

* Guesstimated, based upon limited data
** Limited sample

1. Lessons 10 and 12 were separated into 10-1, 10-2 and 12-1 and 12-2 due to the 300 frame limit per lesson imposed by the CDTS. This limit also caused lesson 13 to be separated into five sections: 13-1, 13-2, 13-3, 13-4, 13-5.

2. BODY AND REVIEW

   Short = The least amount of time spent by a trainee
   Long = The largest amount of time spent by a trainee
   M = Mean lesson time expended

   TEST - The same type of information as above, only pertaining to the test portion of the lesson (including any needed remediation forced by the lesson).

   SUBTOTALS - Short and long are trainee totals and do not reflect the modular extremes previously mentioned. Note that in most cases the short and long columns under the body and review and test when added together will not equal the short/long subtotals. The mean subtotals is obtained by adding the body/review and test means.

TABLE 5 - Lesson Execution Effective Time - Phase I (Sheet 2 of 2)

DERIVED FACTORS		TOTALS		
BREAKS	TERMINAL	M	SHORT	LONG
:35	:23	4:04	3:47	4:20
:40	:26	4:35	4:16	5:31
:30	:19	3:27	3:06	3:49
:25	:15	2:44	2:12	3:03
:30	:19	3:28	2:50	4:41
:10	:08	1:19	1:00	1:38
:35	:20	3:41	3:17	4:36
:40	:24	4:20	3:24	4:50
:20	:12	2:12	1:53	2:35
:35	:23	4:06	2:59	4:20
:10	:06	1:01	:50	1:25
:35	:21	3:49	2:59	4:46
:15	:08	1:30	1:06	2:09
:40	:24	4:24	3:39	5:49
:30	:18	3:12	2:35	3:35
:25	:16	2:52	2:21	3:10
:25	:15	2:41	2:15	3:02
:30	:19	3:23	2:49	4:50
:30	:18	3:16	2:50	3:33
9:00	5:34	60:04	50:08	71:42

COMMENTS

DERIVED FACTORS -

Breaks - Based upon a factor which allows one (1) ten minute break per hour.

Terminal - Mean amounts of terminal down time encountered based upon 7.2 minutes lost per hour.

TOTALS - The subtotals are added to the derived factors.

TABLE 6 - Lesson Execution By Trainees - Phase I

TRAINEE	Phase	1	2	3	4	5	6	7	8	9	10-1	10-2	11	12-1	12-2	13-11	13-12	13-21	13-22	13-23
	P																			
1	B	1:39	3:30	1:49	:47	1:28	:17	1:18	1:28	1:08	2:35	:31	2:01	1:36	1:51	1:44	1:14	1:33	1:46	1:52
(41:24)	R	:24																		
	T	(1:19)	(:55)	1:09	:45	:33	:25	1:06	:52	:13	:29	:11	:16	:10	:44	:26	:41	:15	:14	:10
		3:22	4:25	2:58	1:32	2:01	:42	2:24	2:20	1:21	3:04	:42	2:17	1:46	2:35	2:10	1:55	1:48	2:00	2:02
	P																			
2	B	1:42	2:15	1:53	1:21	1:17	:26	1:32	1:59	:59	1:54	:30	2:00	:51	1:46	2:01	1:42	2:02	2:09	1:54
(47:02)	R	:15	:11		:10	:08		:07			:02									
	T	(1:19)	1:03	(1:07)	:47	:51	:23	1:08	1:35	1:04	1:22	:04	1:09	:23	:56	:43	:45	:20	:14	:43
		3:16	3:29	3:00	1:78	2:16	:49	2:47	3:34	2:03	3:18	:34	3:09	1:14	2:42	2:44	2:27	2:22	2:23	2:37
	P		:39									:12								
3	B	1:35	2:10	1:38	1:05	1:44	:48	1:36	2:51	1:07	2:11		2:01	:46	2:23	2:07	1:24	1:58	2:14	2:14
(45:49)	R																			
	T	(1:19)	(:55)	1:07	:53	1:02	:16	1:13	:55	:28	:59	___	:54	:18	1:04	:20	:38	:20	:24	:31
		2:54	3:44	2:45	1:58	2:46	1:04	2:49	3:46	1:35	2:40	:12	2:55	1:04	3:27	2:27	2:02	2:18	2:38	2:45
	P																			
4	B	1:17	2:27	1:14	1:18	1:20	:30	1:36	2:15	1:02	2:12	:32	1:08	:31	1:46	1:14	1:06	1:37	1:48	2:03
(44:15)	R	:22					:20													
	T	(1:19)	:47	(1:07)	1:04	1:00	:30	:54	1:16	:21	1:10	:37	:55	:12	2:59	:33	:43	:15	:27	:37
		2:58	3:14	2:21	2:22	2:20	1:20	2:30	3:31	1:23	3:22	1:09	2:03	:43	4:45	1:47	1:40	1:52	2:15	2:40
5	P																			
(45:51)	B	1:30	2:39	1:10	1:36	2:13	:53	1:39	2:27	1:05	1:41	:37	2:13	:32	2:07	2:03	1:14	1:48	1:58	1:58
	R												:02							
	T	(1:19)	(:55)	1:07	:47	:22	:25	:43	1:09	:39	:58	:05	1:35	:14	1:27	:24	1:15	:21	:26	:13
		2:49	3:34	2:17	2:23	2:35	1:18	2:22	3:36	1:44	2:39	:42	3:50	:46	3:34	2:27	2:29	2:11	2:24	2:11
	P																			
6	B	1:36	2:15	1:20	:53	2:21	:33	2:40	1:30	1:05	1:45	:23	1:54	:53	1:29	1:49	1:47	1:20	2:56	2:09
(46:54)	R	:23				:45														
	T	(1:19)	(:55)	1:05	:58	(:46)	:20	(1:01)	1:20	:53	1:33	:13	1:09	:13	1:24	:58	:34	:15	1:05	:24
		3:18	3:10	2:25	1:51	3:52	:53	3:41	2:50	1:58	2:01	:36	3:03	1:06	2:53	2:47	2:21	1:35	4:01	2:33

P = Pretest
B = Body
R = Review
T = Test
() = Mean times based upon approximated or limited data

Total effective time for each trainee is listed under his number designator.

TABLE 7 - Phase I Remote Terminal Effectiveness

Device #	Days Of Attempted Use	Days Of Non-Function	% Degradation	Daily Mean Effective Time	Daily Mean Time Loss					% Terminal Effectiveness
					Time Out	Close Hang	Misc.	Totals	% Loss	
1	15	3	20	175	4	5.4	.3	9.7	5.3	74.7
2	20	7	35	124	5.3	11.1	5	21.4	14.8	50.2
3	20	8	40	160	4.6	2.3	1.8	8.7	5.2	54.8
4	16	1	63	136	5	5.8	5.3	16.1	10.6	83.1
5	16	4	25	119	4.4	1.5	3.3	9.2	7.2	67.8
6	19	ø	0	142	4	1.1	.5	5.6	3.8	96.2
7	19	ø	0	136	7.2	3.6	2.3	13.1	8.8	91.2
8	11	3	27.3	263	7.8	3	0	10.8	3.9	68.8
			A						B	C

COMMENTS

A. Percent Degradation = $\frac{\text{Days of Non-Function}}{\text{Days of Attempted Use}}$

B. Percent Loss = $\frac{\text{Daily Mean Loss Total}}{\text{Daily Mean Effective Time}}$

C. Percent Terminal Effectiveness = 100-(A+B)

TABLE 8 - Time Expended by Trainees - Phase II (Sheet 1 of 2)

MINUTES

Dates	28	29	30	1	2	3	5	6	7
Actual Begin	1830	1825	1825	1845	1937	0837	1800	1830	1855
End	2400	2400	2400	2400	2400	1200	2400	2400	2400
Time Expended	2640	2680	2680	2520	2104	1624	2880	2640	2440
Scheduled Time	2880	2880	2880	2880	2880	1920	2880	2880	2880
Effective Time	2372	2147	1831	2204	745	1558	2377	2202	1805
Down Time	508	733	1049	676	2135	362	503	678	1075
Computer Operations	240	200	200	360	776	296	0	240	440
Terminal-Down	39	54	360	18	0	21	420	258	305
Terminal TO/ Close/Ribbon	149	255	105	122	39	45	83	116	234
OS	80	104	104	144				64	
DCH		120	40	32					
Disk									96
Other Hardware			240						
Power Failure					1320				

COMMENTS

Scheduled Time: 6 Hours X 8 Remote Terminals = 2880 Minutes

TABLE 8 - Time Expended by Trainees - Phase II (Sheet 2 of 2)

MINUTES

Dates	8	9	10	12	13	14	15	16	17	19
Actual Begin	1800	1843	0805	1845	1848	1800	1823	1820	0800	1840
End	2400	2400	1200	2400	2400	2400	2400	2400	1200	2400
Time Expended	2880	2536	1880	2520	2496	2880	2696	2720	1920	2560
Scheduled Time	2880	2880	1920	2880	2880	2880	2880	2880	1920	2880
Effective Time	1718	1925	1538	2041	2134	1240	2406	1726	1826	2445
Down Time	1162	955	382	839	746	1640	474	1154	94	435
Computer Operations	0	344	40	360	384	0	184	160	0	320
Terminal-Down	597	440	240	315	29	28	10	46	0	98
Terminal TO/ Close/Ribbon	117	91	102	164	253	108	280	412	94	61
OS	40	80				64				
DCH					80					
Disk	408									
Other Hardware						1440		16		56
Power Failure								520		

TOTALS

	In Mins.	%
Scheduled Time	51840	100.0
Effective Time	36240	69.9
Down Time	15600	30.1
Computer Operations	4544	8.8
Terminal-Down	3278	6.3
Terminal To/Close/Ribbon	2830	5.5
OS	680	1.3
DCH	272	.5
Disk	504	1.0
Other Hardware	1752	3.4
Power Failure	1840	3.5

No time was lost due to:

- Program Recompilation
- CDTS Errors

TABLE 9 - Criterion Test Scores by Phase II Trainees

Trainee Identification	LESSONS														
	1	2	3	4	5	6	7	8	9	10	11	12	13-1	13-2	MDN.
1	97	92	92	91	77	93	89	100	87	93	98	93	94	94	93
2	78	88	95	91	86	79	93	59	96	86	95	86	98	96	89.5
3	97	100	95	95	95	93	93	93	87	93	95	96	96	100	95
4	94	97	92	89	95	100	89	81	100	84	95	98	98	92	94.5
5	88	92	97	95	86	97	89	93	83	93	71	93	98	98	93
6	81	73	82	84	64	84	48	59	71	86	79	74	94	(82)	80
7	94	89	95	95	91	93	93	81	87	88	95	95	98	92	93
8	97	92	97	100	95	93	78	100	96	98	90	98	96	94	96
9	97	97	100	100	100	97	93	96	100	98	93	90	100	96	97
10	94	88	87	89	91	87	78	74	83	91	83	93	90	86	87.5
11	88	92	87	91	95	100	74	81	100	86	93	90	98	92	91.5
12	88	100	97	95	82	84	78	67	92	98	98	86	96	88	90
MDN.	94	92	95	93	91	93	89	81	89.5	93	94	93	98	93	93

COMMENTS

A. Medians in rows reflects overall score for each trainee across all lessons.

B. Medians in columns reflect overall test results achieved by all trainees for a specific lesson.

TABLE 10 - Missed Test Items - Phase II Trainees

LESSONS

Number of Questions Missed	1	2	3	4	5	6	7	8	9	10	11	12	13-1	13-2	Totals
Total Items	32	33	38	38	22	30	27	27	24	44	42	42	49	50	498
ø	14	18	22	18	11	12	8	8	10	25	23	21	37	31	258
1	11	7	9	16	3	10	5	4	6	8	7	11	7	11	115
2	1	3	3	2	4	5	5	3	4	5	7	3	3	3	51
3	3	4	1		1	1	3	5	2	1	2	4	1	2	30
4	2		2		2	1	3	3	2	3		1		1	20
5	1	1	1	1		1	1	2		1	1		1	1	12
6				1			1	1			1	2			6
7								1						1	2
8										1					1
9					1		1				1				3

TABLE 11 - Sample of Item Analysis and Disposition--Phase II

Reference 1

LESSONS

Item #	No. Missed	No Change	Rewrite Frame(s)	Create Frame(s)	Alter Test Q
1					
132	4				X
135	4		X		
147	5			X	
154	3	X		X	
160	3	X			
162	3	X			
2					
221	3	X			
225	3		X	X	
237	5		X		
240	3		X	X	
3					
154	4				X
169	4				X
182	5				X
151	3	X			
4					
163	5			X	
166	6				X
5					
132	9		X	X	
133	4		X	X	
136	4				X
137	3				X
6					
72	4		X		
77	3	X			
92.6	5		X		X

LESSONS

Item #	No. Missed	No Change	Rewrite Frame(s)	Create Frame(s)	Alter Test Q
7					
126	6			X	
128	9		X	X	X
130.1	3	X			
130.7	4			X	
131.8	3		X	X	
134	5		X	X	
135	3		X	X	
145	4		X	X	
146	4		X		X
8					
128	3	X			
129	4		X	X	
131	3		X	X	
136	6			X	
144	4		X		
145	7			X	
146	3			X	
147	5	X			
149	5		X	X	
150	4		X	X	
151	5			X	
154.5	3			X	
9					
137	4		X		
145	4			X	
152	3		X		X
153	3				X

LESSONS

Item #	No. Missed	No Change	Rewrite Frame(s)	Create Frame(s)	Alter Test Q
10					
254	3			X	X
257	4		X		X
259	4		X		X
263	5		X	X	X
282	8		X	X	
283	4		X		X
11					
181	3			X	X
208	3			X	X
209	9			X	X
210	5			X	X
211	6		X	X	X
12					
292	3	X			
293	3	X			
297	3			X	X
306	6			X	X
307	6			X	X
311.5	4		X		X
319.5	3		X		X
13-1					
194.3	5				X
366	3				X
13-2					
218.9	3		X		X
219	7		X		X
407.2	5				X
610	3				X
612	3				X

POST-TEST FRAME ANALYSIS FORM

COMPUTER OPERATOR TRAINING MODULE

PHASE II

LESSON 7

	F#132	F#133	F#134	F#135	F#136	F#137
T1						
T2			Machine oriented			
T3						
T4			Load Application			
T5						
T6	B (IL)		Instruction	Instruction	B (Source Program)	A (IL)

POST-TEST FRAME ANALYSIS FORM

COMPUTER OPERATOR TRAINING MODULE

PHASE II

LESSON 7

	F# 132	F#133	F#134	F#135	F#136	F#137
T7						
T8						
T9						
T10						
T11			Report	Report		
T12			Coded	Output		

SELECTED TEST QUESTIONS

Reference 3

132 What is the programming language in which the programmer uses symbolic code and macro instructions?

A Procedure-oriented language
B Intermediate language
C RPG language
D+ Machine-oriented language
E Machine language

133 What converts symbolic code to machine languages?

A Generator
B Compiler
C+ Assembler
D Translator
E None of the above

134 A ---------- program is input to the assembler/compiler.

A+ Symbolic
B+ Source

135 The machine language program that is the output of the assembler/compiler is called an ---------- program.

A+ Object

136 What is the same as an object program?

A Compiler Input
B Source Program
C+ Loadable Application Program
D Hexadecimal Program
E None of the above

137 Pick out the higher-order, user-oriented language which allows one to write programs.

A Intermediate language
B Machine-oriented language
C Machine language
D+ Procedure-oriented language

TABLE 12 - Response Latencies--Phase II

Delay In Seconds	NUMBER OF OCCURRENCES BY DAY																			
	April 28	29	30	May 1	2	3	5	6	7	8	9	10	12	13	14	15	16	17	19	N
1																		1		1
2																		4		4
3					1				3		3	1						5		13
4		2	3		1		9	8	10		9		4	3	1	1		20		71
5	7	1	5	1	1	2	12	8	7	3	5	4	6	6	1	4	6	2		81
6	1		1	3	1	2	11	12	10	4	7	3	9	4	2	3	6	1		80
7	10	2	6	4	4	1	8	7	9	7	3	6	3	4	2	9	7	5	NO DATA AVAILABLE	97
8	14	3	1	5	1	3	6	5	4	3	5	3	2	3	1	5	5	5		74
9	3	5		1		1	4	6	1	2	2	3	3	3	1	3	5	2		45
10	15	2	1	4	2	1	7	7	4	3	3	5		2	1	3	3			63
11	2	1	1	1	1	1	3	2	1		1	1	1	1	1	1	1	4		24
12	4	1		2		1	4	5	2	4	1	2		1		4	2			33
13	4	1			2		2	3	2	2	1									17
14	4	1	1		2		1		3					1	1			2		16
15	3		1	1	1		1	2						1				1		11
16		1					1					1	1				1			5
17	1				1		1		2					1		1		2		9
18	1		1				1													3
19	1																	2		3
20	3						1													4
21																	1			1
22	1				1															2
23																				0
24							1							1			1			3
25		1												1		1				3
N	74	21	21	22	19	12	73	65	58	28	40	29	29	32	11	35	38	56	-	663
MED	10	9	7	8	10	8	7	7	6	7.5	6	8	6	7	7	8	7.5	4	-	7

TABLE 13 - Samples of Forms Used in Phase I Validation Activity

Reference 1

EXPLANATION OF CDTS VALIDATION FORMS--PHASE I

CDTS TIME ORDERED LOG - The purpose of this form is for the recording of system down time. It is used by the monitors. They note the time problems begin and end, and make notations in the appropriate event columns. The three areas are:

1) Hardware - All problems directly related to the terminal or the computer and any of its associated hardware.

2) Program - An error condition resulting from a flaw in the CDTS program.

3) Course logic - Does the course do what it logically should? (Not the measuring of how well it teaches.) Errors here would be attributed to decision frame inadequacies, faulty item sets, incorrect feedback type, incorrect branching, and the like.

TRAINEE COMMENT SHEET - This form is used by the monitors. It is the heart of the validation process. The monitor notes the frame # from the lesson printout, and makes descriptive comments of anything which may be of use for course modification. This would include not only any error conditions encountered and audible comments, but also all observed mannerisms. In short, all information gathered will be used which might indicate a possible problem for the trainee.

The time portion located in the upper right hand corner is a back-up to the TRAINEE RECORDING LOG.

TRAINEE RECORDING LOG - The trainee merely enters the times he began and finished the four major breakdowns of the course material. He also enters the name of each lesson. Should he need more space for entering times for a given lesson, he duplicates the lesson name in the column immediately to his right.

FRAME ANALYSIS - Used by the validator for the recording of all the salient points uncovered during:

1) The GIVE session.

2) The critique sessions immediately following the lesson proper.

Course modifications will be done primarily as a result of the information recorded on this chart.

Computer Operator Training Module

CDTS TIME ORDERED LOG

Phase_____

_____
Date

_____ _____
Trainee Terminal

_____
Lesson

Reference 2

Time Begin	Time End	Event		
		Hardware	Program	Course Logic

Reference 3

COMPUTER OPERATORS TRAINING MODULE

PHASE _____

TRAINEE COMMENT SHEET

TIME BEGAN

TRAINEE	TERMINAL	LESSON	DATE

Pretest _____

Body _____

Review _____

Test _____

Finish _____

FRAME	COMMENTS

PHASE_____

TRAINEE NAME_____

COMPUTER OPERATORS TRAINING MODULE

TRAINEE RECORDING LOG

LESSON

Time Began/End	COϕ1$\phi\phi$								
Prerequisite									
Lesson Material									
Review									
Test									

LESSON

Time Began/End									
Prerequisite									
Lesson Material									
Review									
Test									

FRAME ANALYSIS

COMPUTER OPERATOR TRAINING MODULE

LESSON_____ DATE_____

	F#	F#	F#	F#	F#	F#
T1						
T2						
T3						
T4						
T5						
T6						

TABLE 14 - Samples of Forms Used in Phase II Validation Activity

Reference 1

EXPLANATION OF PHASE II VALIDATION FORMS

TRAINEE COMMENT SHEET - This form is used DAILY by trainees during Phase II to record several categories of information.

The trainee enters his name, the remote terminal identification, the name of the lesson and the date in the space provided. The time portion refers to the four major areas of the course material. The trainee enters the time he begins and ends each area. A time is not required if a particular area is omitted. The trainee also logs the beginning and end time for each break taken during a particular session in the space provided.

In the terminal down time portion of the form, the trainee COUNTS the number of times the remote terminal is timed out either in the transmit or receive mode of operation. The number of times the functional system closes the device, thus requiring an OPEN, is also tallied. The amount of time lost due to the paper or ribbon malfunctioning, and any other problems relating to the remote terminal should be noted.

The remainder of the form is used to record all comments relating to the lesson being executed. Any time the trainee feels something is wrong with the lesson, the material is not clear or is misleading, or an apparent inserted answer was considered incorrect, etc., he writes a number on his printout (starting at 1 and proceeding in sequential order). He then enters that reference number and documents all pertinent data on this sheet. This provides a cross-reference for use by the monitors after the session has ended.

If more than one sheet is used, the trainee enters the page number in the space provided (upper right) on the form.

TIME ORDERED GROUP DOWN TIME LOG - The purpose of this form is for the recording of system down time as opposed to specific problems relating to a lesson or remote terminal and is used by the monitors. They note the time problems begin and end, and make notations in the appropriate event columns.
The two areas are:

1) Hardware/MCP - All problems directly related to the computer hardware as well as the Master Control Program (MCP).

2) CDTS Program - An error condition resulting from a flaw in the CDTS program.

Reference 2

COMPUTER OPERATORS TRAINING MODULE

TRAINEE COMMENT SHEET

TRAINEE	TERMINAL	LESSON	DATE

TIME BEGAN

Pretest_____
Body _____
Review _____
Test _____
Finish _____

BREAKS

Begin_____
End _____
Begin_____
End _____
Begin_____
End _____

TERMINAL DOWN TIME

Time Outs_____
System Close_____
Ribbon/Paper_____
Other _____
_____
_____
_____

REFERENCE #	COMMENTS

Computer Operators Training Module Phase II

TIME ORDERED

GROUP DOWN TIME LOG

Date

Reference 3

Time Begin	End	Event	
		Hardware/MCP	CDTS Program

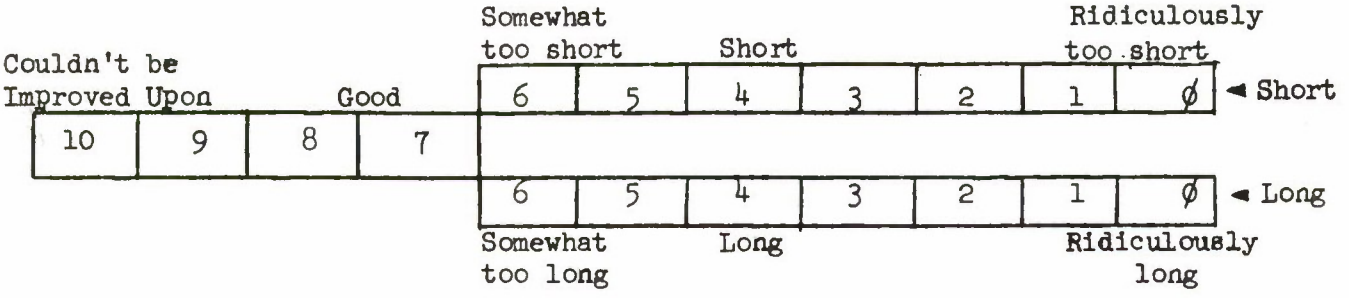
Reference 4 COMPUTER OPERATORS TRAINING MODULE (Sheet 1 of 2)

TRAINEE ATTITUDE SURVEY PHASE II

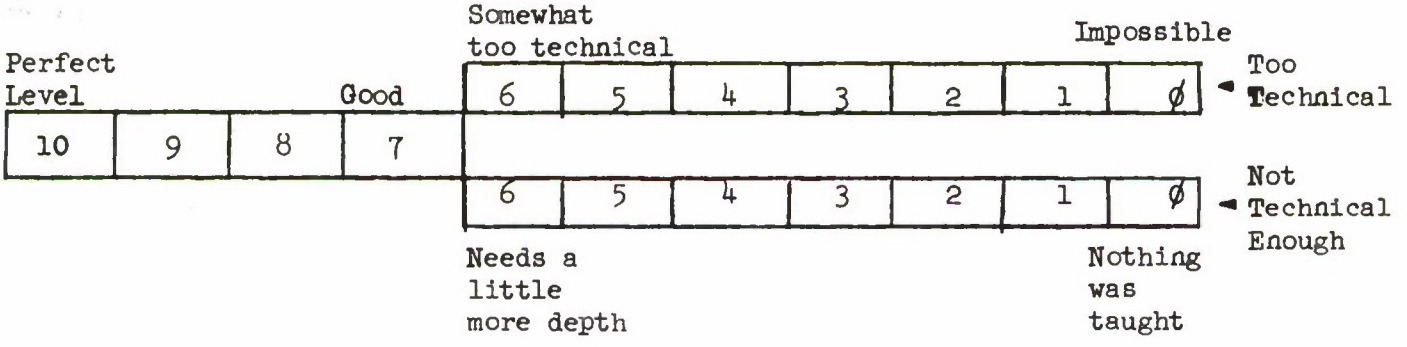
LESSON MATERIAL

Lesson Name CO_____ Trainee Name _____

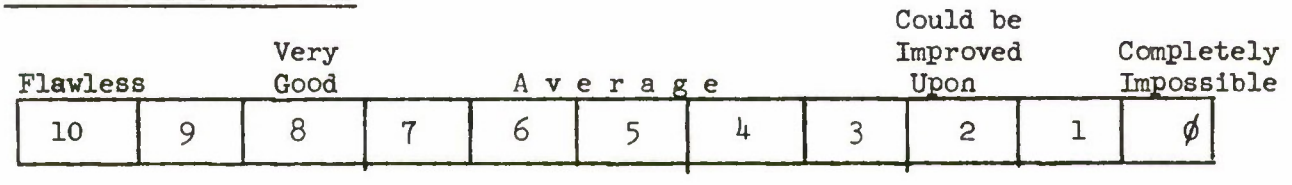
1) COURSE LENGTH - As it relates to the amount of time expended to teach the actual material covered.



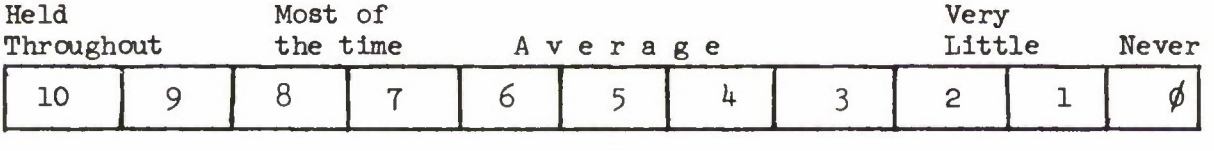
2) TECHNICAL LEVEL OF MATERIAL



3) TEACHING APPROACH USED



4) MATERIAL HOLDS INTEREST



Form 2 (4-15) Page 1 of 2

5) UNDERSTANDABILITY OF MATERIAL

Couldn't have been easier		Better than average			Understandable			Could have been more Understandable		Totally Impossible
10	9	8	7	6	5	4	3	2	1	∅

6) HOW WELL WAS MATERIAL TAUGHT

Couldn't have been Better		Very Well		A v e r a g e			Rather Poorly			Learned Nothing
10	9	8	7	6	5	4	3	2	1	∅

7) HUMANIZATION OF MATERIAL

Perfect		Very Human			Almost Right			Not much Feeling		Completely Devoid of any Feeling
10	9	8	7	6	5	4	3	2	1	∅

8) FEEDBACK

Extremely Helpful			Very Helpful		Of Average Help		Not too Meaningful			Absolutely No Help
10	9	8	7	6	5	4	3	2	1	∅

9) EXHIBITS

		Couldn't be easier to use		Average		Difficult	Couldn't use at all
N/A	USABILITY	5	4	3	2	1	∅

	Perfectly		About Right			Added Absolutely Nothing
COMPLEMENT THE LESSON?	5	4	3	2	1	∅

Appendix IV

FORMAL QUALIFICATION TESTING RESULTS

The printouts generated as part of the Formal Qualification Testing conducted 16-18 June 1969 are presented.

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PRINTOUTS OF "TRAINEE" AND "COURSE DESIGNER" ACTIONS

The printouts generated by the CDTS as the Test Team member executed DEMOØ1 and DEMOØ2 as a "trainee" are contained on the left side of each page. The printouts generated by the Test Team member acting as a "course designer" are contained on the right side of each page.

An attempt has been made to relate the "trainee" and "course designer" printouts to reflect the interaction required during the conduct of the Formal Qualification Testing. A blank page indicates action was not required by one of the Test Team members at that particular position in the test.

-TO RESUME PROCESSING, LOG IN
*open for e 575349169
ENTER INITIAL COMMAND TO CDTS.
?get demoØ1 wsuzuki
Ø69167

- C D T S -

CDTS IS THE COMPUTER DIRECTED TRAINING SUBSYSTEM OF
THE AIR FORCE PHASE II BASE LEVEL SYSTEM

WOULD YOU BE INTERESTED IN A BRIEF DESCRIPTION OF THE PURPOSE,
ORGANIZATION, AND OPERATION OF CDTS, OR SHOULD WE MOVE DIRECTLY TO A
DETAILED DEMONSTRATION OF ITS FUNCTIONS AND CAPABILITIES?
(CHOOSE A OR B)
A PLEASE PRESENT A BASIC DESCRIPTION OF CDTS
B LET'S MOVE ON TO THE DETAILED DATA
*.
a
CDTS IS A GENERAL PURPOSE TRAINING SYSTEM WHICH USES A USER-ORIENTED
LANGUAGE (SOMETHING LIKE COBOL) TO PERMIT COURSE DESIGNERS TO CONSTRUCT
MATERIAL FOR ANY TRAINING PURPOSE. THIS MATERIAL MAY BE INPUT TO THE
SYSTEM IN AN ON-LINE MODE FROM A REMOTE TERMINAL, OR CONSTRUCTED FROM
CARD INPUT TO A BATCH PROCESSING PROGRAM.

ONCE CONSTRUCTED, LESSON MATERIAL IS SAVED ONTO DISK STORAGE FOR
FUTURE PRESENTATION.
TO ACCOMPLISH ITS TRAINING OBJECTIVES, CDTS IS DIVIDED INTO
FIVE BASIC COMPONENTS:

1) A CONTROL FUNCTION
2) A LESSON-BUILDING MODE
3) A LESSON-EXECUTION MODE
4) AN OFF-LINE LESSON-BUILDING MODE
5) A TRAINEE RECORD PROCESSING PROGRAM

THE DESIGN OF THE B35ØØ SYSTEM REQUIRES THAT EACH ON-LINE SYSTEM SUCH
AS CDTS HAS ONE SEGMENT OF THE PROGRAM THAT PROVIDES THE COMPLETE
INTERFACE WITH THE MASTER CONTROL PROGRAM (MCP) AND DATA
COMMUNICATIONS HANDLER (DCH). THIS PART OF CDTS CONTROLS
THE OPERATION OF THE LESSON-BUILDING AND LESSON EXECUTION MODES, AND
IS CALLED THE ------- FUNCTION.
*.
control
RIGHT - THE CONTROL FUNCTION PROVIDES THE INTERFACE.

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AS STATED A MOMENT AGO, THE LESSON-BUILDING MODE OF CDTS PERMITS AUTHORIZED PERSONNEL TO CONSTRUCT COURSE MATERIAL FOR A VARIETY OF TRAINING PURPOSES. SINCE THE MATERIAL DEVELOPED UNDER CDTS MAY HAVE TO BE MODIFIED IN TIME, THE LESSON-BUILDING MODE PROVIDES A CAPABILITY OF CHANGING A LESSON WITHOUT HAVING TO ENTIRELY RETYPE IT.

THIS MODIFICATION CAPABILITY IS A SUB/ MODE OF LESSON/BUILDING AND WOULD BE CALLED:

A LESSON-BUILDING
B LESSON-EDITING
C LESSON-SAVING
*.
b
FINE
THE LESSON-EXECUTION FUNCTION PERMITS THE PRESENTATION OF COURSE MATERIAL TO STUDENTS AT REMOTE TERMINALS, JUST AS THIS DEMONSTRATION IS CURRENTLY BEING PRESENTED.

LESSON-EXECUTION EVALUATES STUDENT RESPONSES TO TEST ITEMS AND PRESENTS ADDITIONAL MATERIAL BASED UPON STUDENT PROGRESS.
TO USE THE THE LESSON-EXECUTION PORTION OF THE SYSTEM, ONE MUST HAVE PREVIOUSLY CONSTRUCTED AT LEAST ONE LESSON, THROUGH THE

LESSON -------- MODE.
*.
building
VERY GOOD
WE HAVE BRIEFLY DISCUSSED EACH OF THE THREE SEGMENTS OF THE ON-LINE PORTION OF CDTS. THERE ARE TWO BATCH PROCESSING PROGRAMS WHICH ARE USED IN CONJUNCTION WITH THE ON-LINE FUNCTIONS TO PROVIDE A TOTAL SYSTEM CAPABILITY.

ONE BATCH PROCESSING PROGRAM PERMITS AUTHORIZED PERSONNEL TO ACCESS THE RECORDS OF TRAINEE OR STUDENT PERFORMANCE THAT ARE COMPILED DURING THE EXECUTION OF A LESSON. THIS PROGRAM OUTPUTS REPORTS ON EACH TRAINEE AND QUITE NATURALLY IS CALLED THE TRAINEE ------ PROCESSING PROGRAM.
*.
records
OK
A BIT LATER IN THIS DEMONSTRATION WE'LL SEE SOME EXAMPLES OF THE EXACT FORMAT AND CONTENT OF THE TRAINEE RECORDS. BUT FIRST LET'S CONSIDER THE FIFTH AND LAST OF THE MAJOR FUNCTIONS OF CDTS-----

Page 159 blank

TYPING EACH LINE OF DATA FOR A LESSON INTO CDTS FROM A REMOTE TERMINAL CAN BE A TIME CONSUMING PROCESS. TO BE FREED FROM THIS CHORE, THE COURSE DESIGNER MAY MANUSCRIPT HIS LESSON ON KEYPUNCH FORMS. THE KEYPUNCHED DECK IS THEN INPUT TO A BATCH PROCESSING PROGRAM WHICH CHECKS FOR FORMAT ERRORS, BUILDS THE LESSON ONTO DISK STORAGE, AND FINALLY OUTPUTS A LISTING OF THE LESSON CONTENTS, ALONG WITH NOTATIONS OF ANY DETECTED ERRORS.

THIS BATCH PROCESSING METHOD OF LESSON BUILDING ELIMINATES THE REQUIREMENT FOR THE "ON-LINE" PORTION OF CDTS TO BE OPERATING, AND IS LOGICALLY NAMED --- ---- LESSON BUILDING.

A OFF LINE
B ON LINE
C KEYPUNCHED
*.
b
YOU'VE MISSED THE KEY POINT. THE PROGRAM ELIMINATES THE NEED FOR GOING ON-LINE WITH CDTS. LET'S GO BACK AND LOOK AT THE FACT THAT TYPING EACH LINE OF DATA FOR A LESSON INTO CDTS FROM A REMOTE TERMINAL CAN BE A TIME CONSUMING PROCESS. TO BE FREED FROM THIS CHORE, THE COURSE DESIGNER MAY MANUSCRIPT HIS LESSON ON KEYPUNCH FORMS. THE KEYPUNCHED DECK IS THEN INPUT TO A BATCH PROCESSING PROGRAM WHICH CHECKS FOR FORMAT ERRORS, BUILDS THE LESSON ONTO DISK STORAGE, AND FINALLY OUTPUTS A LISTING OF THE LESSON CONTENTS, ALONG WITH NOTATIONS OF ANY DETECTED ERRORS.

THIS BATCH PROCESSING METHOD OF LESSON BUILDING ELIMINATES THE REQUIREMENT FOR THE "ON-LINE" PORTION OF CDTS TO BE OPERATING, AND IS LOGICALLY NAMED --- ---- LESSON BUILDING.

A OFF LINE
B ON LINE
C KEYPUNCHED
*.
a
RIGHT
THIS CONCLUDES THE INTRODUCTORY MATERIAL ON THE ORGANIZATION OF CDTS. YOU SHOULD NOW MAKE A DECISION ON WHETHER TO BE PRESENTED WITH AN EXPLANATION OF THE MECHANICS OF USING THE SYSTEM, OR MOVE DIRECTLY TO A RATHER DETAILED PRESENTATION ON THE STRUCTURE OF CDTS LESSONS. (TYPE IN THE LETTER OF YOUR CHOICE

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A BRING ON THE NITTY GRITTY OF LESSON STRUCTURE
 B I'D RATHER HAVE AN EXPLANATION OF THE USE OF CDTS
 *.
b
FINE

THE GET COMMAND

THE "GET" COMMAND IS THE INITIAL INPUT FROM THE USER TO CDTS TO BEGIN OR CONTINUE EXECUTION OF A LESSON, OR CONTINUE BUILDING/EDITING OF AN EXISTING LESSON.

THE FORMAT OF THE GET COMMAND FOR THE STUDENT IS "?GET LESSON LASTNAME" WHERE THE NAME OF ANY EXISTING LESSON IS FOLLOWED BY THE STUDENT'S LAST NAME AND INITIALS, UP TO A TOTAL OF 16 CHARACTERS.
CDTS WILL RECOVER FROM AN INVALID "GET" INPUT COMMAND AS FOLLOWS:

1) AN ATTEMPT TO GET A NON-EXISTANT LESSON WILL RESULT IN THE OUTPUT OF THE ERROR MESSAGE - "LESSON NOT ON DISK"

2) AN ATTEMPT TO GET A LESSON, USING AN INCOMPLETE FORMAT, WILL RESULT IN THE OUTPUT OF THE ERROR MESSAGE - "INCOMPLETE COMMAND"

TO VERIFY THIS PROCESSING, TYPE IN "?QUIT" AND THEN CREATE THE ABOVE TWO ERROR CONDITIONS. FOLLOWING THE REJECTION OF THESE ATTEMPTS, TYPE IN ?GET DEMOØ1 LASTNAME AND YOU'LL RETURN TO THIS POINT.

THERE ARE TWO OTHER TYPES OF ERROR CONDITIONS WHICH CAN RESULT FROM A GET COMMAND.

THE FIRST INVOLVES AN ATTEMPT TO GET A SECOND LESSON BEFORE THE USER INDICATES TO THE SYSTEM THAT HE WISHES TO "QUIT" EXECUTING THE FIRST. SINCE YOU ARE CURRENTLY EXECUTING LESSON "DEMOØ1", AN ATTEMPT TO GET ANOTHER LESSON SUCH AS "COØ1ØØ" WILL BE RESPONDED TO WITH THE MESSAGE "LESSON ASSOC'D".

(PLEASE TYPE GO AFTER ATTEMPTING TO GET ANOTHER LESSON AND WE WILL CONTINUE.)

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```
  ?Get CØØ1ØØ
 INCOMPLETE COMMAND
 ?Get CoØ1ØØ esther
LESSON ASSOC'D
 GO
```
THE LAST CDTS REACTION TO AN ILLEGAL GET COMMAND WILL BE DEMONSTRATED SHORTLY, WHEN WE CONSIDER THE "CO" INPUT.

CDTS WILL PERMIT SIMULTANEOUS EXECUTION OF THE SAME LESSON FROM ANY NUMBER OF REMOTE DEVICES, AND EACH USER'S POSITION WITHIN A LESSON IS MAINTAINED INDEPENDENTLY. TO VERIFY THIS CAPABILITY, THE USER AT THE OTHER TERMINAL SHOULD GET LESSON DEMOØ1 AND EXECUTE BRIEFLY. WHEN THIS HAS BEEN DONE TYPE CONTINUE AT THIS DEVICE. YOU WILL FIND THAT YOUR PLACE WITHIN THE LESSON HAS NOT BEEN CONFUSED WITH HIS.

*.

```
COMPUTER READY - LOG IN
YOUR DEVICE ID IS ØE.

FUNCTIONAL SYSTEMS ACTIVE -   E  .

 *open for e 561Ø94871
ENTER INITIAL COMMAND TO CDTS.
#get demoØ1 rc
Ø69167
ALLOW TRAINEE ACCESS?Y/N
 Y
ENTER COMMAND
"h#ex 47Ø
     3)  IF THE LINE BEGINS WITH A LETTER FOLLOWED IMMEDIATELY BY A
 COLON (:), THE PROGRAM ASSUMES IT IS AN ACTION COMMAND AND CHECKS TO
 DETERMINE IF THE LETTER IS A LEGAL ACTION COMMAND.

IF THE ACTION COMMAND IS LEGAL (F:, C:, R:, B:), PROCESSING OF THE
 LINE CONTINUES.

IF THE ACTION COMMAND IS ILLEGAL, THE LINE IS IGNORED AND THE PROGRAM
 PROCESSES THE NEXT LINE IN SEQUENCE OR BRANCHES TO THE NEXT FRAME IN
 THE LESSON SEQUENCE IF THE FINAL LINE OF THE GROUP IS REACHED.

IF A MATCH OCCURS WITH A CORRECT ANSWER INDICATED BY THE PLUS SIGN (+)
TO THE RIGHT OF THE ANSWER TAG IN GROUP -----.
*.
#save done
SAVED
```

continue
THE COURSE DESIGNER MAY HAVE TO MAKE CHANGES TO A LESSON WHILE IT IS BEING EXECUTED BY A TRAINE. THE USER AT THE OTHER TERMINAL WILL RELOG INTO THE SYSTEM AS THE COURSE DESIGNER OF THIS LESSON. WHEN THE QUESTION "ALLOW TRAINEE ACCESS Y/N" APPEARS, HE WILL TYPE IN "N."

THIS ACTION WILL RESULT IN THE OUTPUT OF THE MESSAGE "LESSON ACCESS NOW DENIED BY CD" AT THIS AND ANY OTHER TERMINAL WHERE THE LESSON IS BEING USED BY A STUDENT.

TYPE GO WHEN THIS HAS BEEN ACCOMPLISHED. YOU WILL FIND THAT YOUR ANSWER IS NOT ACCEPTED. THE NORMAL PRACTICE FOR THE STUDENT WOULD BE TO CHECK WITH HIS TRAINING SUPERVISOR. IF THE STUDENT ATTEMPTS TO GET THE LESSON AGAIN, YOU WILL SEE THAT HE WILL BE DENIED ACCESS. (WHEN THE COURSE DESIGNER IS FINISHED, ACCESS WILL BE AGAIN PERMITTED.)
TYPE READY WHEN THIS HAS BEEN DEMONSTRATED.
*.
go
LESSON ACCESS NOW DENIED BY CD

?GET DEMOØ1 Esther
Ø61669
TYPE READY WHEN THIS HAS BEEN DEMONSTRATED.
*.
Ready
WE REALLY DO NOT WANT TO DEMONSTRATE THE FULL COURSE DESIGNER CAPABILITIES AT THIS TIME. FIRST LET'S CONSIDER THE REST OF THE CHARACTERISTICS OF THE GET COMMAND.

THE MOST IMPORTANT ASPECT TO THE TRAINEE IS THAT THE PROGRAM PICKS HIM UP AT THE POINT IN THE LESSON WHERE HE LAST QUIT. TO DEMONSTRATE THIS, TYPE IN ?QUIT BEFORE ANSWERING THE NEXT QUESTION.
AFTER THE MESSAGE "ENTER INTIAL COMMAND" IS OUTPUT, YOU WILL HAVE TO TYPE IN ?GET DEMOØ1 LASTNAME AND YOU WILL BE PRESENTED WITH THE QUESTION AGAIN.

WHAT IS THE COMMAND THAT IS USED BY A TRAINEE TO ACCESS A LESSON?
A CO
B OPEN
C GET
*.
?quit
ENTER INITIAL COMMAND
?get demoØ1 esther

```
#get demoØ1 rc
Ø61669
 ALLOW TRAINEE ACCESS?Y/N
N
ENTER COMMAND
#save done
 SAVED
#get demoØ1 rc
 Ø61669
ALLOW TRAINEE ACCESS?Y/N
Y
ENTER COMMAND
 #save done
 SAVED
```

WHAT IS THE COMMAND THAT IS USED BY A TRAINEE TO ACCESS A LESSON?
A CO
B OPEN
C GET
*.
GET
CHOOSE ONE OF THE ABOVE LETTERS
 *.
c
OK
A LITTLE LATER WE WILL INPUT THE QUIT COMMAND WITHIN ANOTHER LESSON,
AND GET THIS ONE AGAIN, TO VERIFY THAT CDTS CAN"BOOKKEEP" USER'S
POSITIONS WITHIN MORE THAN ONE LESSON AT THE SAME TIME.

DURING THIS NEXT SECTION, WHICH DEALS WITH THE "CO" COMMAND, WE WILL
VERIFY OTHER VARIATIONS IN THE USE OF THE "GET".

THE "CO" COMMAND IS THE ONLY OTHER INITIAL COMMAND ACCEPTED BY CDTS.
THIS COMMAND INITIATES LESSON BUILDING OF A NEW LESSON OR PERMITS
CONTINUATION OF THE CONSTRUCTION OF AN EXISTING LESSON.

BEFORE WE BEGIN AN EXPLANATION OF THE FORMAT AND PROPER USE OF THE
"CO" COMMAND, IT MIGHT BE APPROPRIATE TO HAVE A BETTER UNDERSTANDING
OF THE STRUCTURE OF A CDTS LESSON.

IF YOU WOULD BE INTERESTED IN THIS BACKGROUND INFORMATION, TYPE IN
"YES". IF YOU TYPE IN ANY OTHER RESPONSE WE WILL MOVE DIRECTLY TO THE
DETAILS OF THE "CO".

*.
yes
OK, LET'S LOOK AT THE CDTS "FRAME" CONCEPT.
                CDTS LESSON STRUCTURE

LESSON MATERIAL IS INPUT TO CDTS BY THE COURSE DESIGNER IN "FRAME"
UNITS. EACH "FRAME" IS FURTHER SEGMENTED INTO "GROUPS" AND THESE GROUPS
ARE COMPOSED OF INDIVIDUAL LINES OF INFORMATION. A LESSON IS THEREFORE
A COLLECTION OF LINES WITHIN GROUPS, AND GROUPS WITHIN ------
(TYPE IN THE TERM FOR THE LARGEST UNIT OF INFORMATION INPUT TO CDTS.)
*.
frames
RIGHT - THE FRAME IS THE LARGEST UNIT OF A CDTS LESSON.
TO PROVIDE THE COURSE DESIGNER WITH THE FLEXIBILITY HE NEEDS TO SATISFY

Page 169 blank

VARYING TRAINING REQUIREMENTS, FOUR TYPES OF FRAMES ARE AVAILABLE FOR COURSE DESIGNER SELECTION. THESE TYPES ARE REFERED TO AS
"Q,M,D, AND C" WHERE:

Q= QUESTION FRAME--NORMALLY USED TO PRESENT COURSE CONTENT MATERIAL TO INFORM OR REQUIRE A CONSTRUCTED RESPONSE.

M= MULTIPLE CHOICE-NORMALLY USED TO PRESENT COURSE MATERIAL AND ALTERNATIVE ANSWER CHOICES FOR SELECTION.

D= DECISION FRAME--NORMALLY USED TO ESTABLISH CONDITIONAL STATEMENTS WHICH ARE EXECUTED DEPENDING UPON RESPONSES TO ONE OR MORE FRAMES.

C= COPY FRAME------A LESSON BUILDING AID RATHER THAN A DIFFERENT FRAME TYPE, SO THAT PREVIOUSLY CONSTRUCTED FRAMES CAN BE COPIED AT A DIFFERENT POINT IN THE LESSON

TO PRESENT TEXTUAL MATERIAL AND QUESTIONS TO THE STUDENT, AND SUBSEQUENTLY EVALUATE STUDENT RESPONSES, THE COURSE DESIGNER WOULD THEN SELECT WHICH FRAME TYPES? (TYPE IN A SINGLE LETTER)

A Q AND C
B Q AND D
D M AND C
C Q AND M
E M AND D
F C AND D
*.
c
CORRECT
WHICH FRAME TYPE WOULD BE USED TO CONTROL THE STUDENT'S PATH THROUGH THE LESSON, BASED UPON HIS PREVIOUS RESPONSES?

*.
decision
FINE
NOW THAT YOU UNDERSTAND THE CONCEPT OF THE FRAME, LET'S CONSIDER THE ELEMENTS OF FRAMES, WHICH ARE CALLED ------.

*.
groups
GROUPS DIVIDE THE FRAME INTO ONE TO FOUR SUBSETS OF DATA, WHERE EACH SUBSET CONTAINS INFORMATION USED FOR THE SAME PURPOSE.

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THE FIRST GROUP (GROUP 1) CONTAINS IDENTIFYING INFORMATION. THE SECOND GROUP (GROUP 2) NORMALLY CONTAINS TEXTUAL MATERIAL. GROUP 3 SPECIFIES ANSWERS TO BE USED BY THE PROGRAM IN EVALUATING STUDENT RESPONSES. THE GROUP 4 SPECIFIES ACTIONS TO BE TAKEN BY THE PROGRAM, AS A RESULT OF THE STUDENT RESPONSES.

(ALL GROUPS ARE NOT LEGAL WITHIN ALL FRAME TYPES, BUT WE'LL CONSIDER SUCH RESTRICTIONS A LITTLE LATER, WHEN WE EXAMINE THE SPECIFICS OF BUILDING OF GROUPS, FRAMES AND LESSONS.

THE CO COMMAND
****

THE 'CO' COMMAND FOLLOWS THE 'GET' COMMAND WHEN THE COURSE DESIGNER WISHES TO ADD TO AN EXISTING LESSON. IN THIS CASE THE COURSE DESIGNER MERELY INPUTS '#CO', FOLLOWING THE 'ENTER COMMAND' MESSAGE. NO OTHER PARAMETERS ARE REQUIRED.

TO DEMONSTRATE THE CONTINUANCE OF LESSON BUILDING, THE COURSE DESIGNER AT THE OTHER TERMINAL WILL 'CO' AFTER GETTING LESSON 'DUMMY', WHICH ONLY HAS TWO FRAMES. FOLLOWING THE 'Q,M,D,C' PROMPT TO IDENTIFY THE FRAME TYPE, THE CD WILL BE INFORMED THAT THE PROGRAM IS READY TO BUILD FRAME 3.

THE ACTUAL MECHANICS OF FRAME BUILDING WILL BE DEMONSTRATED SHORTLY, SO WE'LL MOVE ON TO THE OTHER ASPECTS OF THE "CO". (TYPE IN "COMMENCE" AFTER FRAME 3 HAS BEEN STARTED.)
*.

```
#get dummy rc
ø69167
ALLOW TRAINEE ACCESS?Y/N
Y
ENTER COMMAND
#co
Q,M,D,C
*.
q
FRAME    3.ø LABEL
 *.
?quit
ENTER INITIAL COMMAND
```

commence

TO COMMENCE BUILDING A NEW LESSON, YOU NATURALLY DO NOT HAVE TO FIRST EXECUTE THE --- COMMAND.

A CO

B GET
*.
a
RIGHT

THE FORMAT OF THE "CO" COMMAND TO BEGIN CONSTRUCTION OF A NEW LESSON IS "#CO LSSNØØ AA," WHERE LSSNØØ IS A SIX CHARACTER LESSON NAME, AND THE AA IS A TWO CHARACTER COURSE DESIGNER IDENTIFICATION.
TO DEMONSTRATE THIS, THE CD ON THE OTHER REMOTE WILL "?QUIT" LESSON "DUMMY" AND ATTEMPT TO "CO DUMMY2 XX". THE INDICATION THAT LESSON BUILDING HAS STARTED IS THE "Q,M,D,C" CUE. AFTER SELECTING A FRAME TYPE HE WILL BE INFORMED THAT FRAME 1.Ø IS READY FOR INPUT.

AS YOU MIGHT EXPECT, THE COURSE DESIGNER CANNOT ALWAYS COMPLETE THE CONSTRUCTION OF A LESSON IN ONE ON-LINE SESSION. AFTER THE CD HAS BUILT FRAME 1, TYPE IN "READY FOR TWO" AND WE'LL SEE HOW HE CAN GO AWAY AND THEN PICK UP THE CONSTRUCTION OF "DUMMY2" AT FRAME TWO.

*.
ready for two
OK, BUT FIRST HE WILL HAVE TO "SAVE" DUMMY2. HE WILL THEN GET THE LESSON, "CO", AND BE CUED TO BUILD FRAME TWO. THE PURPOSE OF THIS EXERCISE IS TO PROVE THAT YOU CAN "SAVE" A LESSON (THE FULL IMPLICATIONS OF THE SAVE WILL BE EXPLAINED SHORTLY) AND CONTINUE TO BUILD IT IMMEDIATELY THEREAFTER. TYPE "DONE" AFTER HE IS CUED TO START THE FRAME.

*.
done

```
#co dummy2 xx
Q,M,D,C
*.
q
FRAME   1.Ø LABEL
 *.
^
G.2 TEXT
*.
this is frame 1 of dummy2
  *.
$
Q,M,D,C
*.
#save done
SAVED
#get dummy2 xx
Ø6169
ALLOW TRAINE ACCESS?Y/N
Y
ENTER COMMAND
 #co
Q,M,D,C
 *.
q
FRAME   2.Ø LABEL
*.
?quit
ENTER INITIAL COMMAND
```

NOW WE WILL HAVE A LOOK AT THE WAYS ONE CAN IMPROPERLY USE THE CO.
ONE WAY WOULD BE TO INPUT THE COMMAND TO BUILD A NEW LESSON, WITHOUT:
A SPECIFYING A LESSON NAME
B SPECIFYING A CD ID
C EITHER OF THE ABOVE
*.
c
RIGHT - OMITTING EITHER PARAMETER IS ILLEGAL

THE CD AT THE OTHER TERMINAL WILL RECEIVE THE INCOMPLETE COMMAND
MESSAGE WHEN HE OMITS THIS INFORMATION. HE WILL THEN ATTEMPT TO CO A
NEW LESSON, BUT USING THE NAME OF AN EXISTING LESSON.

WHAT MESSAGE WOULD YOU EXPECT AS A RESULT OF THIS ACTION?
A "LESSON ALREADY EXISTS"
B "INCOMPLETE COMMAND"
C "ILLEGAL COMMAND"
*.
a
TRUE
AFTER THE HANDLING OF THESE ACTIONS HAS BEEN VERIFIED, TYPE IN
"GO".
*.
go
THE LAST FUNCTION OF THE CO TO BE VERIFIED IS THE ABILITY TO COMMENCE
BUILDING A NEW FRAME AFTER HAVING "RESTARTED" AN OLD LESSON WITH THE
SAME NAME. WE'LL DO THIS SHORTLY, WHEN WE LOOK AT THE ENTIRE AREA OF
THE RESTART COMMAND. FOR NOW, LET'S MOVE ON AND EXAMINE THE CDTS
USER OPTIONS.

```
 #co lssn
INCOMPLETE COMMAND
 #co dummy2 rc
LESSON ALREADY EXISTS
```

End of Day 1 Formal Qualification Testing

Course Designer

CDTS OPTIONS
****

THERE ARE TWO OPTIONS AVAILABLE TO THE USER OF CDTS. ONE IS 'GOTO' AND THE OTHER IS 'QUIT'. WE WILL CONSIDER GOTO AND THEN QUIT.

THE GOTO OPTION PERMITS THE TRAINEE OR COURSE DESIGNER IN A PSEUDO-TRAINEE ROLE TO BRANCH TO A SPECIFIED FRAME LABEL WITHIN THE LESSON BEING EXECUTED. WHEN INSERTED WITH A LEGAL FRAME LABEL, THE PROGRAM BRANCHES UNCONDITIONALLY TO THE FRAME LABEL INDICATED.

THIS ALLOWS THE STUDENT TO MOVE ABOUT A GIVEN LESSON AT HIS OWN DISCRETION, ONCE HE IS MADE AWARE OF THE GOTO OPTION FORMAT AND THE ACCESSIBLE FRAME LABELS WITHIN THE LESSON.

THE FORMAT FOR THIS OPTION IS:

    ?GOTO LABEL

TO VERIFY THIS OPTION AS USED BY A STUDENT, YOU WILL BE REQUIRED TO USE THIS COMMAND IN SEVERAL DIFFERENT SITUATIONS.

THE FIRST SITUATION WILL BE TO GOTO THE SAME FRAME CURRENTLY BEING EXECUTED.

THIS FRAME WILL BE PRESENTED AGAIN AFTER YOU INSERT:

    ?GOTO F113

THE NEXT TIME IT PRINTS AND STOPS, TYPE GO.
*.
?goto f113
THIS FRAME WILL BE PRESENTED AGAIN AFTER YOU INSERT:

    ?GOTO F113

THE NEXT TIME IT PRINTS AND STOPS, TYPE GO.
*.
go
FINE
THE ABOVE FRAME SHOULD HAVE PRINTED TWICE

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TO VERIFY THIS CONDITION, INPUT ?GOTO F113 AGAIN AND WHEN AN *. IS
PRESENTED, TYPE GO.
*.
?goto f113
THIS FRAME WILL BE PRESENTED AGAIN AFTER YOU INSERT:

    ?GOTO F113

THE NEXT TIME IT PRINTS AND STOPS, TYPE GO.
*.
go
FINE
NOW, LET'S ATTEMPT TO GO TO A NONEXISTENT FRAME LABEL.

INPUT:

    ?GOTO L1ØØ

AFTER THIS HAS BEEN DONE AND THE ERROR MESSAGE

    ILLEGAL BRANCH

IS OUTPUT, TYPE "?GOTO F117", AND WE WILL CONTINUE.
*.
?goto l1ØØ
ILLEGAL BRANCH
ENTER COMMAND
?goto fll7

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NOW, HAVE THE PERSON AT THE OTHER CONSOLE ATTEMPT TO GOTO A FRAME LABEL WITHIN THIS LESSON BEFORE BECOMING ASSOCIATED WITH THE LESSON AS A COURSE DESIGNER.

HAVE THAT PERSON INSERT THE COMMAND:

?GOTO F118

THE PROGRAM SHOULD INDICATE:

ILLEGAL FIRST COMMAND

AFTER THIS IS DONE, TYPE GO.
*.
go
OK
NOW HAVE THE PERSON GET THIS LESSON AND GOTO THE FRAME LABELS AS INDICATED BELOW:

?GOTO SIX

?GOTO F117

?GOTO F118

?GOTO F121

IGNORE THE TEXT OF EACH FRAME UNTIL F121 IS REACHED.

AFTER GOING TO THE FIRST LABEL AND THE PROGRAM STOPS, THE NEXT LABEL SHOULD BE BRANCHED TO USING THE GOTO OPTION. THIS WILL DEMONSTRATE THE ABILITY OF THE PROGRAM TO BRANCH TO SEVERAL LABELS WITHIN THE LESSON BEING EXECUTED.
*.
?quit
CDTS-OUT

End of Day 1 Formal Qualification Testing

Trainee

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```
 ?goto f118
ILLEGAL FIRST COMMAND
 #get demoØ1 9z

  ALLOW TRAINEE ACCESS?Y/N
 Y
ENTER COMMAND
 ?goto six
THE DESIGN OF THE B35ØØ SYSTEM REQUIRES THAT EACH ON-LINE SYSTEM SUCH
 AS CDTS HAS ONE SEGMENT OF THE PROGRAM THAT PROVIDES THE COMPLETE
INTERFACE WITH THE MASTER CONTROL PROGRAM  (MCP)  AND DATA
 COMMUNICATIONS HANDLER  (DCH). THIS PART OF CDTS CONTROLS
 THE OPERATION OF THE LESSON-BUILDING AND LESSON EXECUTION MODES, AND
 IS CALLED THE        -------- FUNCTION.
*.
?goto f117
NOW, HAVE THE PERSON AT THE OTHER CONSOLE ATTEMPT TO GOTO A FRAME LABEL
WITHIN THIS LESSON BEFORE BECOMING ASSOCIATED WITH THE LESSON AS A
 COURSE DESIGNER.

HAVE THAT PERSON INSERT THE COMMAND:

     ?GOTO F118

THE PROGRAM SHOULD INDICATE:

     ILLEGAL FIRST COMMAND

AFTER THIS IS DONE, TYPE GO.
 *.
?goto f121
THIS IS THE FINAL LABELLED FRAME IN THE GOTO SEVERAL LABELS EXERCISE.

A I'M GLAD
B TOO BAD
C LET'S DO IT AGAIN
 *.
```

```
AFTER THIS HAS BEEN DONE AT THE OTHER CONSOLE, DUPLICATE THE ACTIONS
AS A STUDENT AT THIS CONSOLE.
THIS IS THE FINAL LABELLED FRAME IN THE GOTO SEVERAL LABELS EXERCISE.

A I'M GLAD
B TOO BAD
C LET'S DO IT AGAIN
*.
?goto six
THE DESIGN OF THE B35ØØ SYSTEM REQUIRES THAT EACH ON-LINE SYSTEM SUCH
AS CDTS HAS ONE SEGMENT OF THE PROGRAM THAT PROVIDES THE COMPLETE
INTERFACE WITH THE MASTER CONTROL PROGRAM  (MCP)  AND DATA
COMMUNICATIONS HANDLER  (DCH). THIS PART OF CDTS CONTROLS
THE OPERATION OF THE LESSON-BUILDING AND LESSON EXECUTION MODES, AND
IS CALLED THE       ------- FUNCTION.
*.
?goto f117
NOW, HAVE THE PERSON AT THE OTHER CONSOLE ATTEMPT TO GOTO A FRAME LABEL
WITHIN THIS LESSON BEFORE BECOMING ASSOCIATED WITH THE LESSON AS A
COURSE DESIGNER.

HAVE THAT PERSON INSERT THE COMMAND:

     ?GOTO F118

THE PROGRAM SHOULD INDICATE:

     ILLEGAL FIRST COMMAND


AFTER THIS IS DONE, TYPE GO.
*.
?goto f118
HAVE THAT PERSON INSERT THE COMMAND:


     ?GOTO F118

THE PROGRAM SHOULD INDICATE:

     ILLEGAL FIRST COMMAND

AFTER THIS IS DONE, TYPE GO.
*.
```


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?goto f121
THIS IS THE FINAL LABELLED FRAME IN THE GOTO SEVERAL LABELS EXERCISE.

A I'M GLAD
B TOO BAD
C LET'S DO IT AGAIN
*.
a
SO AM I
NOW, HAVE THE PERSON AT THE OTHER CONSOLE ENTER THE COMMAND

    #SAVE DONE

WHICH DISASSOCIATES THE COURSE DESIGNER FROM THE LESSON. AFTER THE MESSAGE:

    SAVED

IS OUTPUT, HAVE THE PERSON INPUT:

    ?GOTO F124

AFTER THE PROGRAM OUTPUTS THE MESSAGE:

    ILLEGAL FIRST COMMAND

TYPE GO TO CONTINUE.
*.

```
#save done
SAVED
?goto f124
 ILLEGAL FIRST COMMAND
```

go
FINE
THE PROGRAM REQUIRES THAT THE USER (COURSE DESIGNER OR STUDENT)
HAVE A LESSON ASSOCIATED BEFORE THE GOTO OPTION IS PERMISSIBLE.

NOW, LET'S CONSIDER THE OTHER OPTION 'QUIT'.

THE QUIT OPTION PERMITS THE USER (STUDENT OR COURSE DESIGNER) TO
TERMINATE THE LESSON CURRENTLY BEING EXECUTED AND INSERT ANOTHER
COMMAND EITHER TO CDTS OR THE MCP.

THE STUDENT NORMALLY USES THE QUIT OPTION PRIOR TO COMPLETING A
LESSON SO THAT WHEN HE 'GETS' THE LESSON AGAIN, HE WILL BE RETURNED
TO THE SAME POSITON WITHIN THE LESSON PRIOR TO ENTERING THE
QUIT OPTION.

THE COURSE DESIGNER MAY USE THE QUIT OPTION IF HE HAS BEEN EXECUTING
THE LESSON AS A PSEUDO-TRAINEE FOR QUALITY CONTROL PURPOSES AND HAS NOT
MODIFIED THE LESSON MATERIAL.

THE FORMAT FOR THIS OPTION IS:

    ?QUIT

FOLLOW THESE STEPS TO VERIFY THIS OPTION:

    FIRST, INSERT ?QUIT

THE PROGRAM WILL INDICATE THE OPTION HAS BEEN ACCEPTED BY OUTPUTTING:

    ENTER INITIAL COMMAND

THIS MESSAGE INDICATES YOU HAVE BEEN DISASSOCIATED FROM THIS LESSON
AND THE PROGRAM IS WAITING FOR THE NEXT COMMAND

INSERT ?QUIT AGAIN AND THE PROGRAM WILL OUTPUT THE MESSAGE:

    ILLEGAL FIRST COMMAND

WHICH INDICATES THAT A USER MUST HAVE A LESSON ASSOCIATED BEFORE IT IS
LEGAL TO QUIT THE LESSON.

FINALLY, USING THE GET COMMAND, REQUEST THIS LESSON AND YOU SHOULD
RETURN TO THE POSITION IN THIS DEMONSTRATION WHERE YOU LEFT OFF.

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THE SEQUENCE WILL BE AS FOLLOWS:

1. ?QUIT
2. ?QUIT
3. ?GET DEMOØ1 (LAST NAME)

TYPE ?QUIT WHEN YOU RECEIVE THE NEXT *.

WHEN YOU SEE THIS LINE AGAIN, TYPE CONTINUE.
*.
* ?quit
ENTER INITIAL COMMAND
* ?quit
ILLEGAL FIRST COMMAND
?get demoØ1 salvage
Ø61769
WHEN YOU SEE THIS LINE AGAIN, TYPE CONTINUE.
*.
continue
FINE.
THE FINAL TEST OF THIS OPTION WILL REQUIRE THAT THE USER AT THE OTHER CONSOLE GET THIS LESSON AS A COURSE DESIGNER AND THEN INSERT THE QUIT OPTION.

THE PROGRAM WILL OUTPUT THE MESSAGE:

ENTER INITIAL COMMAND

WHICH IS THE SAME MESSAGE OUTPUT TO A STUDENT USER.

THIS COMPLETES THE GENERAL DEMONSTRATION OF THE OPTIONS AVAILABLE TO A USER OF THE CDTS. THE TWO OPTIONS ARE QUIT AND ----------.
*.
goto
VERY GOOD, YOU REMEMBERED.
OK, NOW THAT WE HAVE CONSIDERED SOME OF THE BASIC COMMANDS OF CDTS, LET'S DIG INTO THE CONCEPTS OF THE LESSON BUILDING MODE. THERE ARE OTHER COMMANDS WITHIN THE SPECTRUM OF CDTS CAPABILITIES, BUT WE WILL DELVE INTO THEM AT A MORE APPROPRIATE TIME.

```
#get demoØ1 9z
 Ø61769
 ALLOW TRAINEE ACCESS?Y/N
 Y
ENTER COMMAND
 ?quit
ENTER INITIAL COMMAND
```

LESSON BUILDING

THE LESSON BUILDING MODE PERMITS AUTHORIZED PERSONNEL (COURSE DESIGNERS) TO CONSTRUCT AND MODIFY LESSON MATERIAL FOR A VARIETY OF TRAINING PURPOSES. THE CD MAY ENTER LESSON CONTENT, SPECIFY ANSWERS, AND INDICATE ACTIONS TO BE TAKEN (IN THE LESSON EXECUTION MODE) AS A RESULT OF STUDENT RESPONSES. IT ALSO ALLOWS THE CD TO EDIT (ADD, DELETE, OR MODIFY) ANY PORTION OF A LESSON.

AS MENTIONED PREVIOUSLY, A LESSON IS COMPOSED OF FRAMES WHICH IN TURN ARE MADE UP OF GROUPS CONTAINING INDIVIDUAL LINES OF INFORMATION. THE FIRST GROUP WE WILL CONSIDER IS THE CONSTRUCTION AND VERIFICATION OF GROUP 1.

THIS GROUP IS THE FIRST LOGICAL SUBSET OF DATA WITHIN THE LESSON FRAME. IT IS USED BY THE CD TO SELECT THE TYPE OF FRAME TO BE CONSTRUCTED, AND TO LABEL IT IF HE SO DESIRES. THE THIRD PURPOSE OF GROUP 1 IS TO OPTIONALLY FLAG THE FRAME AS ONE TO BE USED BY A SUBSEQUENT DECISION FRAME.

VERIFICATION OF THE CONSTRUCTION OF GROUP 1 OF A FRAME WILL BE PERFORMED BY THE PERSON AT THE OTHER CONSOLE ACTING AS A COURSE DESIGNER. THIS PERSON WILL CONSTRUCT SEVERAL FRAMES FOLLOWING A SCRIPT WHICH IS DESIGNED TO DEMONSTRATE THE LEGAL AND ILLEGAL PARAMETERS OF GROUP 1 CONSTRUCTION.

TO START OR COMMENCE BUILDING A LESSON THE CD MUST USE THE ---------- COMMAND.

```
*.
CO
EXCELLENT.
THE CD WILL INPUT:

    #CO LB1 CD
```

AND THE PROGRAM WILL OUTPUT THE CUE INDICATING THE TYPES OF LEGAL FRAMES AVAILABLE. THESE ARE:

Q - QUESTION
M - MULTIPLE-CHOICE
D - DECISION
C - COPY AN EXISTING FRAME

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THE CD WILL BUILD SEVERAL FRAMES USING EACH OF THE LEGAL FRAME
TYPES AT LEAST TWICE. CERTAIN FRAMES WILL BE LABELLED, SOME WILL BE
LABELLED AND FLAGGED (FOR USE BY A SUBSEQUENT DECISION FRAME), WHILE
OTHERS WILL BE DEVOID OF LABELS OR FLAGS.
FOR EACH LEGAL FRAME TYPE INPUT AND ACCEPTED, THE PROGRAM WILL
INDICATE:

    FRAME XXXX LABEL
    *.

CDTS WILL AUTOMATICALLY NUMBER THE FRAMES SEQUENTIALLY STARTING
WITH 1.Ø

AT FRAME 2.Ø, THE CD WILL INSERT A DUPLICATE LABEL AND THE PROGRAM
WILL INDICATE THAT FRAME 1.Ø IS ALREADY USING THE LABEL.

TYPE GO AFTER THIS ACTION IS COMPLETED.
*.
go
OK
THE CD WILL BUILD AT LEAST TWO FRAMES WHICH WILL NOT BE LABELLED. THIS
IS DONE BY USING THE GROUP EXIT INDICATOR IN LIEU OF INSERTING A LABEL.
THE PROGRAM WILL OUTPUT THE CUE:

    G.2 TEXT

FOR QUESTION OR MULTIPLE-CHOICE FRAMES, AND

    G.2 CONDITIONS

FOR DECISION FRAMES.

AFTER THIS HAS BEEN COMPLETED, TYPE FINE.
*.
fine
FINE IS FINE.

```
#co lbl cd
Q,M,D,C
*.
q
FRAME   1.Ø LABEL
 *.
f1ØØ
G.2 TEXT
*.
$
Q,M,D,C
*.
q1
FRAME   2.Ø LABEL
 *.
f1ØØ
FRAME   1.Ø IS USING THAT LABEL.
  FRAME   2.Ø LABEL
 *.
fØØ2
G.2 TEXT
*.
$
Q,M,D,C
*.
m1
FRAME   3.Ø LABEL
 *.
^
G.2 TEXT
*.
$
Q,M,D,C
*.
m
FRAME   4.Ø LABEL
 *.
^
G.2 TEXT
*.
copy me
*.
$
```

NOW THE CD WILL ATTEMPT TO INSERT TWO LABELS WHICH SHOULD BE
REJECTED AS ILLEGAL. THE PROGRAM WILL OUTPUT:

    ILLEGAL FRAME LABEL

AND THEN ALLOW THE CD TO INSERT A LEGAL LABEL IF DESIRED.

AT FRAME 7.Ø, THE CD WILL ATTEMPT TO INPUT AN ILLEGAL FRAME TYPE.
THE PROGRAM WILL REJECT THIS ATTEMPT AND OUTPUT:

    ILLEGAL FRAME TYPE - ONLY Q/M/D/C CAN BE ENTERED

AFTER THIS OCCURS THE SECOND TIME, TYPE CONTINUE.
*.
continue

```
Q,M,D,C
*.
d
FRAME    5.Ø LABEL
*.
1234a
ILLEGAL FRAME LABEL
 FRAME    5.Ø LABEL
 *.
f123456
ILLEGAL FRAME LABEL
FRAME    5.Ø LABEL
 *.
fØØ5
G.2 CONDITIONS
 *.
$
Q,M,D,C
*.
d
FRAME    6.Ø LABEL
 *.
^
G.2 CONDITIONS
*.
f:copy me
*.
$
Q,M,D,C
*.
a
ILLEGAL FRAME TYPE - ONLY Q/M/D/C CAN BE INSERTED
Q,M,D,C
*.
c 4
Q,M,D,C
*.
 x
 ILLEGAL FRAME TYPE - ONLY Q/M/D/C CAN BE INSERTED
  Q,M,D,C
    *.
```

```
LET'S DO
THE CD WILL ALSO ATTEMPT TO INSERT THE FRAME EXIT INDICATOR AND GROUP
 EXIT INDICATOR PRIOR TO ENTERING A LEGAL FRAME TYPE.  THE PROGRAM
WILL INDICATE:

     ILLEGAL FRAME TYPE

A LEGAL FRAME TYPE THE CD COULD ENTER WOULD BE:
     (TYPE A LETTER ONLY)
*.

q
VERY GOOD.
 THE MAXIMUM NUMBER OF LABELS ALLOWED IN A LESSON IS 49. THE VERIFICA-
TION THAT A 50TH LEGAL FRAME LABEL CANNOT BE INSERTED WILL BE DONE
LATER. ALSO, THE USE AND VERIFICATION OF THE DECISION FRAME INDICATOR
WILL BE ACCOMPLISHED DURING LESSON EXECUTION.

WHEN THE CD HAS COMPLETED THE GROUP 1 CONSTRUCTION AND VERIFICATION,
 TYPE GO

*.
go
FINE
THE NEXT GROUP WE WILL CONSIDER IS GROUP 2.  AS EXPECTED, THIS GROUP
IS THE SECOND LOGICAL SUBSET OF DATA WITHIN THE LESSON FRAME. IT IS
USED BY THE COURSE DESIGNER TO INSERT TEXTUAL MATERIAL TO BE PRESENTED
TO THE TRAINEE WITHIN QUESTION OR MULTIPLE-CHOICE FRAMES, OR TO SPECIFY
THE CONDITION TO BE EXAMINED WITHIN A DECISION FRAME.

AS WITH GROUP 1, THE PERSON AT THE OTHER CONSOLE WILL ACT AS A COURSE
DESIGNER AND CONSTRUCT SEVERAL FRAMES ACCORDING TO A SCRIPT CONCERNED
SPECIFICALLY WITH GROUP 2 VERIFICATION.

THE FIRST GROUP WE DEMONSTRATED WAS:
A 4
B 2
C 1
D 3
*.
c
VERY GOOD, YOU WERE AWAKE.
 TO START OUT, THE CD WILL REQUEST THE PREVIOUS LESSON BY INPUTING THE
COMMAND:
     ---- LB1 CD

*.
```

```
c 6
Q,M,D,C
*.
$
ILLEGAL FRAME TYPE - ONLY Q/M/D/C CAN BE INSERTED
 Q,M,D,C
*.
^
ILLEGAL FRAME TYPE - ONLY Q/M/D/C CAN BE INSERTED
 Q,M,D,C
*.
m
FRAME   9.Ø LABEL
 *.
^
G.2 TEXT
*.
$
Q,M,D,C
*.
#save done
SAVED
```

co
WRONG, YOU MUST 'GET' AN EXISTING LESSON BEFORE YOU CAN 'CO'
(CONTINUE TO BUILD) A LESSON.
THE CD MUST OF COURSE SUCCESSFULLY COMPLETE THE GROUP 1 INPUT
REQUIREMENTS FOR EACH ATTEMPT TO EITHER LEGALLY OR ILLEGALLY INPUT
GROUP 2 MATERIAL.

AFTER 'GETTING' THE LESSON, THE CD WILL CONTINUE TO BUILD THE LESSON
THE FIRST VERIFICATION WILL BE TO EXIT A GROUP 2 PRIOR TO INSERTING
ANY DATA.

WHAT IS THE GROUP EXIT INDICATOR?
*.
$
THE PROGRAM WILL OUTPUT THE CUE FOR GROUP 3

G.3 ANSWERS

IF THE FRAME IS A 'Q' OR 'M' FRAME. FOR A 'D' FRAME, THE PROGRAM
OUTPUTS THE CUE FOR FRAME SELECTION:

Q,M,D,C

AFTER THIS OCCURS TYPE GO.
*.
go
FINE.
NEXT, THE CD WILL ATTEMPT TO START AN ILLEGAL DECISION STATEMENT WITHIN
A DECISION FRAME. THIS WILL BE ATTEMPTED TWICE BY THE CD. FOR EACH
ATTEMPT THE PROGRAM WILL REJECT THE ENTRY AND OUTPUT

REJECTED. ALL DECISION STATEMENTS MUST BEGIN WITH IF, AND, END,
OR, ELSE, F:, B:, OR %:

AND ALLOW THE CD TO CORRECT THE ENTRY. THE PROGRAM DOES NOT CHECK THE
ENTIRE DECISION STATEMENT FOR LEGALITY AT THIS TIME. THIS OCCURS
DURING LESSON EXECUTION. ONLY THE INITIAL WORD OF EACH LINE OF INPUT
IS CHECKED FOR LEGALITY.

AS WITH ALL FRAMES, THE PROGRAM STARTS THE PROCESSING AT THE
TOP AND PROCEEDS LEFT TO RIGHT, TOP TO BOTTOM A SINGLE LINE AT A TIME.
AFTER THIS IS COMPLETED TYPE GO.
*.

```
#get lb1 cd
 ø61769
ALLOW TRAINEE ACCESS?Y/N
Y
ENTER COMMAND
#co
Q,M,D,C
*.
q
FRAME  1ø.ø LABEL
 *.
gp2
G.2 TEXT
*.
^
G.3 ANSWERS
*.
$
Q,M,D,C
*.
d
FRAME  11.ø LABEL
 *.
^
G.2 CONDITIONS
 *.
of right 8 b:end
 REJECTED.  ALL DECISION STATEMENTS MUST BEGIN WITH IF, AND, OR, END, F:, B:, ELSE OR %:
*.
c:
REJECTED.  ALL DECISION STATEMENTS MUST BEGIN WITH IF, AND, OR, END, F:, B:, ELSE OR %:
 *.
^
Q,M,D,C
*.
```

```
go
FINE.
THE CD WILL BUILD A FRAME AND INPUT THE FRAME EXIT INDICATOR PRIOR TO
ENTERING ANY DATA IN GROUP 2. THE PROGRAM WILL OUTPUT THE CUE FOR THE
SELECTION OF THE NEXT FRAME.

WHAT IS THE FRAME EXIT INDICATOR?
     (TYPE THE CHARACTER)
*.
^
FALSE
 THE CORRECT ANSWER IS      $
AFTER THE PROGRAM HAS OUTPUT THE FRAME CUE -- Q,M,D,C


TYPE GO
*.
go
FINE.
THE NUMBER OF CHARACTERS ALLOWED PER FRAME IS 4ØØ. THIS DOES NOT MEAN
THAT THE CD CAN INPUT 4ØØ CHARACTERS SINCE THE PROGRAM MUST USE A SUB-
SET OF THIS TOTAL FOR THE FRAME NUMBER, LABEL (IF INSERTED), GROUP
CUES (I.E. G.2 TEXT, ETC.) AND NUMBER OF CHARACTERS ENTERED IN EACH
LINE.

THIS LEAVES 4ØØ-X FOR USE BY THE CD.  A GOOD RULE OF THUMB IS: AFTER
4 FULL LINES OF TEXT (8Ø CHARACTERS EACH) CREATE ANOTHER FRAME.

THE CD WILL ILLUSTRATE WHAT HAPPENS ON-LINE IF THIS 4ØØ CHARACTER PER
FRAME CAPACITY IS REACHED. ALSO, WITHIN THIS FRAME VARIOUS TYPES OF
CHARACTERS AND CHARACTER COMBINATIONS WILL BE INPUT TO VERIFY THAT ANY
CHARACTER NOT RESTRICTED FROM USE BY THE MCP DCH OR BY THE PROGRAM
CAN BE USED IN A LEGAL MANNER TO CONSTRUCT TEXTUAL MATERIAL.

AFTER THIS IS COMPLETED, TYPE GROUP 3.
*.
```

```
m
FRAME  12.Ø LABEL
 ^*.
^
G.2 TEXT
*.
$
Q,M,D,C
*.
m
FRAME  13.Ø LABEL
 *.
^
G.2 TEXT
*.
this frame will be used to deonstrate what happens when
 *.
the capacity of 4ØØ charaacters for a single frame is
 *.
exceeded as well as different combinations of legal char-
 *.
acters:acters:
*.
ABCDEFGHIJKLMNOPQRSTUVWXYZ,
 *.
123456789Ø
*.
f:, b:, +,\ /.
*.
x#?aaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaa
 *.
now is the time when all good men acome to the aid of their country
*.
aaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaa
FRAME  CAPACITY REACHED. DELETE LINES  TO CONTINUE
 *.
#save done
SAVED
```

group 3
OK, GROUP 3 IS NEXT.
AS INDICATED IN THE FEEDBACK, WE WILL NOW CONSIDER GROUP 3. THIS IS THE THIRD LOGICAL SUBSET OF DATA WITH THE QUESTION AND MULTIPLE-CHOICE FRAMES. IT IS USED BY THE COURSE DESIGNER TO IDENTIFY THE CORRECT ANSWER TO BE ACCEPTED IN RESPONSE TO GROUP 2 TEXTUAL MATERIAL, AND ALSO TO SPECIFY INCORRECT ANSWERS THAT ARE ANTICIPATED TO BE INSERTED BY TRAINEES. THE GROUP IS ALSO USED BY THE CD TO TURN THE SERVICE FUNCTIONS, ORDER, PHONETIC AND KEYWORD ON AND OFF.

THE EXECUTION OF GROUP 3 IS DEPENDENT IN PART UPON THE COMPARISON OF INSERTED RESPONSES WITH SPECIFIED ANSWERS. THE PROGRAM PROCESSES THE INSERTED INFORMATION FROM LEFT TO RIGHT -- TOP TO BOTTOM.

THE INSERTED CONTENT IS EXAMINED TO DETERMINE IF A TAG Ø EXISTS. IF YES, THE PROGRAM SETS THE SERVICE FUNCTION INDICATOR (E.G., KEYWORD ON, ORDER OFF) PRIOR TO ACCEPTING AND PROCESSING AN INSERTED RESPONSE. A SERVICE FUNCTION WITH A TAG OF 1-9 IS EXECUTED IN THE ORDER FOUND WITHIN THE FRAME.

FOR EACH INSERTED RESPONSE, THE PROGRAM EXAMINES THE ANSWER TAGS, (A-Z). ALL ANSWER TAGS (EXCEPT TAG Ø) ARE EXECUTED IN ORDER FROM TOP TO BOTTOM, REGARDLESS OF ANY SEQUENCE ORDERING UNTIL A MATCH (BETWEEN THE INSERTED RESPONSE AND THE ANSWER(S) CONSTRUCTED BY THE (CD) IF ANY, IS FOUND. NO FURTHER ANSWERS ARE PROCESSED IN THE GROUP AFTER A MATCH IS FOUND.

A NUMERIC TAG CAN BE USED ONLY WITH
A ANSWERS
B OPTIONS
C COMMANDS
D SERVICE FUNCTIONS
*.
d
RIGHT.
THE ANSWER(S) WITH A PLUS (+) SIGN PRECEEDING ANY ANSWER TAG INDICATES A RESPONSE IS TO BE CONSIDERED CORRECT IF A MATCH OCCURS. THE PLUS SIGN IS NOT PRINTED WITH THE ALTERNATIVE-ANSWER IN THE MULTIPLE-CHOICE FRAME.

IF SERVICE FUNCTIONS, KEYWORD, PHONETIC, AND/OR ORDER ARE PLACED IN THE 'ON' CONDITION IN THE 'Q' FRAME ANY APPROPRIATE PREPROCESSING OF THE INSERTED--SPECIFIED ANSWER IS ACCOMPLISHED PRIOR TO AN ATTEMPTED MATCH.

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ONCE A RESPONSE HAS BEEN INSERTED, THE PROGRAM ATTEMPTS TO FIND A MATCH EITHER WITH A CORRECT ANSWER OR AN INCORRECT ANSWER. IF A MATCH OCCURS, THE PROGRAM EXECUTES THE ACTION AS SPECIFIED BY THE CD. IF A MATCH DOES NOT OCCUR THERE ARE TWO ALTERNATIVES FOR ACTION.

IF THE INSERTED RESPONSE IS NOT A SINGLE LETTER OR DOES NOT MATCH ONE OF THE TAGS IN THE ANSWER SETS IN A 'M' FRAME. THE PROGRAM FORCES THE USER TO CHOOSE ONE OF THE INDICATED LETTERS. HOWEVER, IF IT IS A 'Q' TYPE FRAME, THE PROGRAM AUTOMATICALLY SEEKS TO DETERMINE THE SUBSEQUENT ACTION.

NOW, LET'S HAVE THE PERSON AT THE OTHER CONSOLE ACT AS A COURSE DESIGNER AND CONSTRUCT SEVERAL FRAMES FOLLOWING THE PREPARED SCRIPT TO VERIFY GROUP 3 CONSTRUCTION.

AGAIN, HE MUST 'GET' THE LESSON AND CONTINUE TO BUILD FRAMES. THE COMMAND HE INSERTS TO BUILD ADDITIONAL FRAMES IS:
*.
co
YES, 'CO' IS THE COMMAND TO CONTINUE TO BUILD FRAMES.
THE FIRST TEST WILL BE TO CONSTRUCT ONE FRAME UP TO GROUP 3 AND THEN INPUT THE GROUP EXIT INDICATOR PRIOR TO ENTERING ANY DATA IN THE GROUP 3. THE PROGRAM WILL OUTPUT THE CUE:

G.4 ACTIONS

INDICATING THE NEXT GROUP CAN BE CONSTRUCTED.

THE CD WILL INPUT THE FRAME EXIT INDICATOR AND RECEIVE THE CUE TO BUILD THE NEXT FRAME.

A SECOND FRAME WILL AGAIN BE CONSTRUCTED UP TO GROUP 3. THIS TIME THE CD WILL INSERT THE FRAME EXIT INDICATOR PRIOR TO ENTERING ANY DATA. THE PROGRAM WILL OUTPUT THE FRAME CUE:

Q,M,D,C

INDICATING THE NEXT FRAME CAN BE CONSTRUCTED.

THIS FRAME EXIT INDICATOR IS A ----------CHARACTER.

(TYPE THE CHARACTER)
*
^
NEGATIVE
THE CORRECT ANSWER IS $
AFTER THE CD HAS COMPLETED THE ABOVE ACTIONS, TYPE GO.
*.

```
#get lbl cd
Ø61769
ALLOW TRAINEE ACCESS?Y/N
Y
ENTER COMMAND
#co
Q,M,D,C
*.
q
FRAME  13.Ø LABEL
 *.
  ^
G.2 TEXT
*.
$
Q,M,D,C
*.
q
FRAME  14.Ø LABEL
 *.
gp3
G.2 TEXT
*.
group test 3
*.
^
G.3 ANSWERS
*.
^
G.4 ACTIONS
 *.
$
Q,M,D,C
*.
m
FRAME  15.Ø LABEL
  *.
^
G.2 TEXT
*.
group 3 test
*.
^
G.3 ANSWERS
*.
$
Q,M,D,C
*.
```

go
FINE.
THE NEXT SERIES OF FRAMES THE CD WILL CONSTRUCT ILLUSTRATES LEGAL AND ILLEGAL FORMATS FOR INSERTING ANSWER TAG--RESPONSES AND SERVICE FUNCTIONS. THERE ARE SEVERAL RESTRICTIONS:

THE ANSWER TAG MUST BE A SINGLE CHARACTER (A-Z) AND BE THE FIRST NONBLANK CHARACTER FOLLOWING THE CUE--*.

A 'BLANK' OR '+' MUST FOLLOW THE ANSWER TAG. THE '+' SERVES AS AN INDICATOR TO THE PROGRAM TO CONSIDER THE ANSWER AS CORRECT WHEREAS, THE BLANK INDICATES THOSE ANSWERS ARE TO BE CONSIDERED INCORRECT IF A MATCH OCCURS.

WHEN THE CD INPUTS AN ILLEGAL ANSWER FORMAT, THE PROGRAM WILL INDICATE

ILLEGAL SECOND CHARACTER

AND ALLOW THE CD TO CORRECT THE ENTRY. THIS WILL BE ATTEMPTED TWICE .

```
q
FRAME  16.ø LABEL
 *.
^
G.2 TEXT
*.
group 3 test
*.
^^
G.3 ANSWERS
*.
ab
ILLEGAL SECOND CHARACTER
*.
c$.
ILLEGAL SECOND CHARACTER
 *.
```

THE FORMAT FOR INSERTING LEGAL SERVICE FUNCTIONS REQUIRES THAT A NUMERIC TAG BE USED, (Ø OR 1-9).

THE Ø TAG TELLS THE PROGRAM TO PROCESS THE SERVICE FUNCTION FIRST AND THEN THE REST OF THE GROUP, WHEREAS THE TAGS 1-9 INDICATE THE SERVICE FUNCTION WILL BE PROCESSED WHEREVER IT IS FOUND IN THE GROUP.

FOR EXAMPLE:

```
Ø SET ORDER ON  (PROCESS ME FIRST)
 A+RED
B WHITE
1 PHONETIC OFF (PROCESS ME HERE. IF A OR B IS MATCHED, I AM
                BYPASSED)
C BLUE
```

THE CD WILL MAKE FOUR ATTEMPTS TO INPUT LEGAL AND ILLEGAL SERVICE FUNCTIONS. FOR EACH ILLEGAL ATTEMPT THE PROGRAM SHOULD INDICATE:

ILLEGAL SERVICE FUNCTION WAS INPUT

AND PERMIT THE CD TO REINSERT A CORRECT ENTRY.

THE SECOND CHARACTER IN A LEGAL ANSWER FORMAT MUST BE A BLANK OR
A ----------.
 *.
+
A PLUS FOR YOU.
 THE CD WILL ALSO CONSTRUCT THREE ANSWERS USING THE SAME ANSWER TAG.

```
A ONE
 A TWO
A THREE
```

THIS IS LEGAL WITHIN THE CDTS, BUT IT IS IMPORTANT FOR THE CD TO ENSURE THE ANSWERS ARE EQUIVALENT AND IN THE DESIRED ORDER. REMEMBER, THE PROGRAM PROCESSES THE GROUP--TOP TO BOTOM, AND LEFT TO RIGHT.

WHEN THE CD HAS CONSTRUCTED FRAME 17.Ø, TYPE GO.
 *.

```
Ø keyboard on
ILLEGAL SERVICE FUNCTION WAS INPUT
*.
3 ordor on
ILLEGAL SERVICE FUNCTION WAS INPUT
*.
7 phonetic off
*.
Ø keyword on
*.
a+right
*.
a+two
*.
a+three
*.
$
Q,M,D,C
*.
q
FRAME  17.Ø LABEL
*.
^
G.2 TEXT
*.
group 3 test
 *.
^
G.3 ANSWERS
*.
a+true
*.
1 phonetic on
*.
b wrong
 *.
2 order off
 *.
c one
*.
$
Q,M,D,C
*.
```

go
FINE.
THE REMAINING FRAMES CONSTRUCTED BY THE CD WILL BE TO CONSTRUCT SEVERAL LEGAL GROUP THREES WITH LEGAL SERVICE FUNCTIONS INTERSPERSED AMONG THE ANSWERS. THE EMPHASIS WILL BE TO INDICATE THAT VARIOUS NUMBERS OF CORRECT ANSWERS OF VARYING LENGTHS CAN BE TAGGED WITHIN A SPECIFIC GROUP 3 AS LONG AS FRAME CAPACITY IS NOT EXCEEDED.

BY THE WAY, THE NUMBER OF CHARACTERS ALLOWED WITHIN A GIVEN FRAME IS?
A 2ØØ
B 3ØØ
C 4ØØ
D 5ØØ
*.
c
RIGHT

```
m
FRAME  18.Ø LABEL
 *.
^
G.2 TEXT
*.
group 3 test
 *.
^
G.3 ANSWERS
*.
a+one
*.
b two
*.
c three
 *.
d four
*.
$
Q,M,D,C
*.
q
FRAME  19.Ø LABEL
*.
^
G.2 TEXT
*.
group 3 test
*.
^
G.3 ANSWERS
*.
a+a
*.
$
Q,M,D,C
*.
q
FRAME  2Ø.Ø LABEL
  *.
^
G.2 TEXT
*.
grooup 3 test
 *.
```

THE CD WILL NOW CONSTRUCT A FRAME TO EXCEED THIS CAPACITY. AFTER THIS
IS COMPLETED TYPE: GROUP 4
*.

```
a this
*.
b is
*.
c+an
*.
d example
*.
e of sevearal possible answers
*.
f+within a single group 3  and i'm glad
*.
$
Q,M,D,C
*.
q
FRAME  21.Ø LABEL
 ^*.
^
G.2 TEXT
*.
one-----------------------------------------
 *.
two------------
 *.
^
G.3 ANSWERS
*.
a+the united states of america. --------------
*.
b the united states air force. ---------------
*.
c now is the time for all good men to come to the aid of their country.
*.
e ------------------------------------------------------------------
*.
f ------------------------------------------------------------------
FRAME CAPACITY REACHED. DELETE LINES  TO CONTINUE
 *.
 #save done
SAVED
```

group 4
FINE HERE IS GROUP 4
NOW WE WILL EXAMINE THE CONSTRUCTION AND VERIFICATION OF GROUP 4.
THIS IS THE LAST LEGAL GROUP WHICH CAN BE CONSTRUCTED AND ENTERED WITHIN A 'Q' OR 'M' FRAME.

IT IS USED BY THE CD TO SPECIFY THE ACTIONS TO TAKE AS THE RESULT OF ANSWERS INSERTED BY THE USER EXECUTING THE LESSON.

THE PROCESSING OF THIS GROUP IS IDENTICAL WITH THE PREVIOUS GROUPS DISCUSSED. (I.E. TOP TO BOTOM, LEFT TO RIGHT). BASED UPON THE COMPARISON OF THE INSERTED RESPONSE WITH THE SPECIFIED ANSWERS, THE PROGRAM EXAMINES GROUP 4 TO DETERMINE THE SUBSEQUENT ACTION.

REGARDLESS OF FRAME TYPE, ('Q' OR 'M'), ANSWERS ARE SPECIFIED IN GROUP ------.

3
YES, GROUP 3.
EACH LINE IN THIS GROUP MUST START WITH EITHER AN:

ANSWER TAG (A-Z)
ACTION COMMAND (F:, C:, R:, B:)
ITEM INDICATOR (PERCENT), OR AN
UNANTICIPATED RESPONSE INDICATOR (-)

THE UNANTICIPATED RESPONSE INDICATOR APPLIES ONLY TO THE QUESTION FRAME.

THERE CANNOT BE ANY UNANTICIPATED RESPONSES WITHIN A MULTIPLE-CHOICE FRAME SINCE THE PROGRAM FORCES THE USER TO CHOOSE ONE OF THE LETTERS FROM THE ALTERNATIVE-ANSWER SETS WHICH ARE PRINTED OUT.

FOR EXAMPLE

TO MOVE ONTO THE NEXT FRAME IN THIS DEMONSTRATION YOU MUST 'PICK' ONE OF THE FOLLOWING LETTERS. IF YOU DON'T BELIEVE IT, PICK A LETTER NOT REPRESENTED AND SEE WHAT HAPPENS.
A PICK
M ONE
T OF
Z THESE
D LETTERS
*.
x
CHOOSE ONE OF THE ABOVE LETTERS
*.
a
YOU DID IT.

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THE PROGRAM PROCESSES THE INFORMATION IN THIS GROUP AS FOLLOWS:

1) IF A LINE BEGINS WITH A SYMBOL, THE PROGRAM ASSUMES IT IS NOT AN ANSWER TAG OR ACTION COMMAND AND CHECKS TO DETERMINE IF IT IS A LEGAL SYMBOL.

MINUS (-) = UNANTICIPATED RESPONSE INDICATOR

PERCENT = ITEM NAME INDICATOR

THE MINUS CAN ONLY BE USED IN THE ----- TYPE FRAME.
*.
q
RIGHT, THE 'Q' FRAME ONLY.
IF THE SYMBOL IS LEGAL, THE LINE IS PROCESSED. IF THE SYMBOL IS ILLEGAL, THE LINE IS IGNORED AND THE PROGRAM PROCESSES THE NEXT LINE IN SEQUENCE OR BRANCHES TO THE NEXT FRAME IN THE LESSON SEQUENCE IF THE FINAL LINE OF THE GROUP IS REACHED.

NO ERROR MESSAGE IS OUTPUT.

2) IF THE LINE BEGINS WITH A LETER(S) NOT FOLLOWED BY A COLON (:), THE PROGRAM ASSUMES THE LETER IS AN ANSWER TAG AND CONTINUES TO PROCESS THE LINE FOR ACTION COMMANDS OR ITEMS. IF AN ACTION COMMAND IS NOT FOUND, THE PROGRAM BRANCHES TO THE NEXT FRAME IN THE LESSON SEQUENCE.

IF AN ACTION COMMAND IS NOT FOUND, THE PROGRAM BRANCHES TO THE NEXT FRAME IN THE LESSON SEQUENCE.

ANSWER TAGS MAY BE ANY LETTER FROM A TO ----.
*.
z
RIGHT, YOU REMEMBER THE ALPHABET.

3) IF THE LINE BEGINS WITH A LETTER FOLLOWED IMMEDIATELY BY A COLON (:), THE PROGRAM ASSUMES IT IS AN ACTION COMMAND AND CHECKS TO DETERMINE IF THE LETTER IS A LEGAL ACTION COMMAND.

IF THE ACTION COMMAND IS LEGAL (F:, C:, R:, B), PROCESSING OF THE LINE CONTINUES.

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IF THE ACTION COMMAND IS ILLEGAL, THE LINE IS IGNORED AND THE PROGRAM PROCESSES THE NEXT LINE IN SEQUENCE OR BRANCHES TO THE NEXT FRAME IN THE LESSON SEQUENCE IF THE FINAL LINE OF THE GROUP IS REACHED.

IF A MATCH OCCURS WITH A CORRECT ANSWER INDICATED BY THE PLUS SIGN (+) TO THE RIGHT OF THE ANSWER TAG IN GROUP -----.
*.
3
YES
THE PROGRAM SEARCHES THE GROUP TO DETERMINE IF A SIMILIAR TAG EXISTS IN GROUP 4. IF FOUND, THE ACCOMPANYING ACTION COMMAND, IF ANY, IS EXECUTED. IF A MATCH OCCURS WITH AN INCORRECT ANSWER (NO PLUS SIGN), THE PROGRAM LOOKS FOR A SIMILIAR TAG IN GROUP 4.

IF FOUND, THE ACCOMPANYING ACTION COMMAND, IF ANY, IS EXECUTED.

THE PROGRAM PROVIDES FOR UNANTICIPATED RESPONSES IN THE 'Q' FRAME ONLY. IF A MATCH DOES NOT OCCUR IN GROUP 3, THE PROGRAM LOOKS IN GROUP 4 TO FIND AN ACTION FOR UNANTICIPATED RESPONSES.

THE UNANTICIPATED RESPONSE INDICATOR IS A -----.
*.
-
CHECK
IN THIS MANNER, THE CD CAN PROVIDE FOR THREE TYPES OF ANSWERS:

CORRECT ANSWERS (THERE MAY BE MORE THAN ONE ACCEPTABLE VARIATION--TWO OR 2)
INCORRECT ANSWERS
UNANTICIPATED ANSWERS (I DON'T KNOW WHAT THE STUDENT WILL INPUT BUT LET'S PROVIDE SOME ACTION)

IF SPECIFIC ACTIONS FOR INSERTED RESPONSES ARE NOT PROVIDED (PLANNED OR NOT), THE PROGRAM AUTOMATICALLY BRANCHES TO THE NEXT FRAME IN THE LESSON SEQUENCE.

THE ACTIONS ARE CONTROLLED BY THE USE OF THE ACTION COMMANDS IN ASSOCIATION WITH THE ANSWER TAGS. AS MENTIONED EARLY, THE FOUR ACTION COMMANDS AVAILABLE ARE. F:, C:, R:, AND B

F: IS USED FOR SPECIFYING FEEDBACK MESSAGES.

F:YOU'RE ON THE RIGHT TRACK.

F:YES, RED IS A PRIMARY COLOR
F:YOU HAVE ALL THE CONCEPTS CORRECT, KEEP UP THE GOOD WORK.

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IF THE PROGRAM ENCOUNTERS AN ITEM NAME INDICATOR (WHICH IS THE):
A PERCENT
B MINUS
C DOLLAR SIGN
D QUESTION MARK
*.
-
CHOOSE ONE OF THE ABOVE LETTERS
*.
b
NO, THAT IS USED FOR UNANTICIPATED RESPONSES. TRY AGAIN.
*.
5ha
YES, IT IS THE PERCENT.
ITEMS CAN BE USED LIKE COUNTERS. WHEN AN EVENT HAPPENS (A RIGHT OR WRONG ANSWER, SEE A FRAME OR FRAMES, ETC.), A MARK IS ENTERED ONTO A TALLEY SHEET, OR AS THEY SAY IN THE WORLD OF PROGRAMMING--INCREASE THE INDEX (ITEM) BY A GIVEN AMOUNT.

CDTS PERMITS THE USE OF THIRTY ITEMS (3Ø) WITHIN A GIVEN LESSON. ITEMØ THROUGH ITEM29 ARE THE ONLY LEGAL ITEM NAMES. EACH ITEM CAN HAVE A NUMERICAL VALUE ASSIGNED. THE VALUE MUST BE A POSITIVE INTEGER WITH A RANGE OF Ø TO 255.

EACH ITEM CAN BE:

SET EQUAL TO AN INTEGER VALUE---ITEM1Ø=15Ø
TESTED FOR AN INTEGER VALUE---IF ITEM3 EQ 4
SET EQUAL TO ANY LEGAL ITEM PLUS OR MINUS AN INTEGER VALUE---
ITEM25=ITEM25+1

ITEMS CAN ONLY BE USED IN GROUP 4 OF THE 'Q' OR 'M' FRAME TYPES. (THEY CAN BE USED IN THE GROUP 2 OF THE 'D' FRAME)

ITEMS OCCURING AT THE BEGINNING OF GROUP 4 ARE EXECUTED UNCONDITIONALLY IF THE EXPRESSION IS LEGAL. AN ITEM MAY PRECEDE OR FOLLOW A TAG-ACTION COMMAND, BUT A SPACE MUST SEPARATE THE EXPRESSION. MORE THAN ONE ITEM EXPRESSION CAN BE INSERTED ON A SINGLE LINE BUT A SPACE MUST SEPARATE THE EXPRESSIONS.

NOW THEN, THE LEGAL ACTIONS COMMANDS ARE:

---:, R:, C:, B:

*.
f:
RIGHT.

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IF A MESSAGE IS NOT SPECIFIED BY THE CD, THE PROGRAM RANDOMLY SELECTS AND PRINTS AN APPROPRIATE MESSAGE.

TRUE, FINE, OK, ETC. FOR CORRECT ANSWERS OR

NEGATIVE, FALSE, INCORRECT, ETC. FOR INCORRECT ANSWERS.

(C:) IS USED TO PRINTOUT THE CORRECT ANSWER AS INDICATED BY THE PLUS SIGN IN GROUP THREE. IF THERE ARE SEVERAL CORRECT ANSWERS (PLUS SIGNS) WHICH ANSWER DO YOU THINK IS PRINTED:
A THE FIRST ANSWER
B SELECTED RANDOMLY
C THE LAST ANSWER
*.
a
RIGHT, THE FIRST ANSWER ENCOUNTERED WITH A PLUS SIGN IS PRINTED.
R: (REPEAT THE FRAME) IS USED TO SPECIFY FEEDBACK MESSAGES REQUIRING ANOTHER ANSWER.

R YOU HAVE THE WRONG NAME. TRY AGAIN.
R:READ THE PARAGRAPH AND TRY AGAIN.
R:YOU'RE NOT EVEN CLOSE. TRY AGAIN.

IF NO FEEDBACK IS PROVIDED THE PROGRAM PRINTS OUT:

WRONG TRY AGAIN

AND WAITS FOR ANOTHER INSERTED RESPONSE.
B: (BRANCH) IS USED TO DISRUPT THE SEQUENCE OF THE LESSON FLOW BY PERMITTING THE BRANCHING TO ANOTHER FRAME OR LESSON.

THE ORDER OF EXECUTION FOR ACTION COMMANDS IS F:, C:, R:, AND B:

TO REPEAT A FRAME THE CD COULD USE THE -----, AS OPPOSED TO THE B:.
*.
r*
WRONG
THE CORRECT ANSWER IS R:
THE B: COULD BE USED SINCE IT IS LEGAL TO BRANCH TO THE FRAME BEING EXECUTED, BUT THE R: IS NORMALLY USED FOR THIS.

FINALLY, ACTION COMMANDS PRECEDED BY AN ANSWER TAG ARE EXECUTED ONLY IF THE INSERTED REPLY MATCHES AN ANSWER BEARING THAT TAG.

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WHICH OF THE FOLLOWING ANSWER TAGS-ACTION COMMANDS STARTING A LINE IN
GROUP 4 ARE LEGAL IN FORMAT.
A A F:
B BCD R
C EFGHI R
D ALL OF THE ABOVE
E NONE OF THE ABOVE
 *.
d
EXCELLENT.
THE PROGRAM PROVIDES THE CD WITH HOW MANY ITEMS.
*.
3Ø
YES Ø TO 29 IS 3Ø ITEMS.
UNANTICIPATED RESPONSES ARE PERMITTED AND IDENTIFIED IN GROUP 4 BY USE
 OF THE ---------- SYMBOL.
 *.
-
VERY GOOD
NOW, AS WITH THE PREVIOUS CONSTRUCTION AND VERIFICATION OF GROUPS 1-3,
 WE WILL HAVE THE PERSON AT THE OTHER CONSOLE ACT AS A COURSE DESIGNER.

HE WILL ONCE AGAIN 'GET' THE LESSON AND CONTINUE TO BUILD FRAMES.

THE FIRST TEST WILL BE TO CONSTRUCT ONE FRAME UP TO GROUP 4 AND THEN
 ENTER THE FRAME EXIT INDICATOR PRIOR TO ENTERING ANY DATA IN THE
 GROUP 4. THE PROGRAM WILL OUTPUT THE CUE:

     Q,M,D,C

TO ALLOW THE CD TO SELECT THE NEXT FRAME.

A SECOND FRAME WILL AGAIN BE CONSTRUCTED UP TO GROUP 4. THIS TIME THE
CD WILL INSERT THE GROUP EXIT INDICATOR PRIOR TO ENTERING ANY DATA.
THE PROGRAM WILL OUTPUT THE FRAME CUE AGAIN SINCE THIS IS THE
LAST LEGAL GROUP WHICH CAN BE CONSTRUCTED WITHIN A FRAME.

THE GROUP EXIT INDICATOR AND FRAME EXIT INDICATOR MUST BE:
 A THE FIRST BLANK CHARACTER ENTERED AFTER THE *.
B THE FIRST NONBLANK CHARACTER ENTERED AFTER THE *
C INSERTED IN GROUP 4 ONLY
 D INSERTED IN GROUP 2 ONLY
 *.
a
NO
THE CORRECT ANSWER IS   THE FIRST NONBLANK CHARACTER ENTERED AFTER THE *.
AFTER THESE TWO FRAMES HAVE BEEN CONSTRUCTED TYPE GO
 *.

```
 #get lb1 cd
ø61769
 ALLOW TRAINE ACCESS?Y/N
Y
ENTER COMMAND
 #co
Q,M,D,C
*.
q
FRAME  21.ø LABEL
 *.
gp4
G.2 TEXT
*.
group 4 test
*.
^
G.3 ANSWERS
*.
^
G.4 ACTIONS
*.
$
Q,M,D,C
*.
q
FRAME  22.ø LABEL
 *.
^
G.2 TEXT
*.
$
Q,M,D,C
*.
q
FRAME  23.ø LABEL
 *.
^
G.2 TEXT
*.
group 4 test
 *.
^
G.3 ANSWERS
*.
^
G.4 ACTIONS
 *.
^
Q,M,D,C
*.
```

go
FINE
NOW THE CD WILL CONSTRUCT A FRAME IN WHICH HE EXCEEDS THE FRAME CAPACITY OF 4ØØ CHARACTERS. ALSO WITHIN THIS FRAME HE WILL DEMONSTRATE THE USE OF ANSWER TAGS, ACTION COMMANDS AND ITEMS.

THE ANSWER TAGS USED MUST BE LETTERS WHICH CAN RANGE FROM A TO -----.
*.
z
FINE
ITEMS CAN BE SET IN A 'Q' OR 'M' FRAME WITHIN GROUP ---.
*.
4
GOOD
AFTER THE CD COMPLETES THIS FRAME, TYPE GO
*.
go
YES
THE CD CAN INSERT A SERVICE FUNCTION----KEYWORD,ORDER, OR PHONETIC WHICH IS ILLEGAL. THE PROGRAM DOES NOT INDICATE THIS IS AN ERROR CONDITION WHEN THE FRAME IS BEING BUILT, BUT WILL IGNORE THE SERVICE FUNCTION DURING LESSON EXECUTION. THIS COULD AFFECT THE DESIRED PROCESSING OF A PARTICULAR FRAME OR SET OF FRAMES.

THE ONLY GROUP A SERVICE FUNCTION CAN BE LEGALLY INPUT IS GROUP ----.
*.
33
GOOD
AND THE ONLY FRAME TYPE IN WHICH THE SERVICE FUNCTIONS WILL OPERATE IS:
A Q
B M
C D
D C
*.
a
OK
THE CD COULD ALSO CONSTRUCT ILLEGAL ITEM FORMATS WHICH WOULD BE ACCEPTED DURING LESSON BUILDING BUT WOULD CAUSE ERROR CONDITIONS TO OCCUR DURING LESSON EXECUTION. IF NAME IS NOT ITEMØ THROUGH ITEM29, THE PROGRAM WILL OUTPUT:

ILLEGAL ITEM NAME

IF THE ITEM VALUE IS NOT A POSITIVE INTEGER OR OUTSIDE THE RANGE OF Ø TO 255, THE PROGRAM INDICATES:

ILLEGAL ITEM VALUE

```
q
FRAME  24.Ø LABEL
 *.
^
G.2 TEXT

*.
the air force receives stellar guidance from the air staff
 *.
^
G.3 ANSWERS
  *.
^
G.4 ACTIONS
*.
a f:this will demonstrate the use of tags and
 *.
b f:action commands which can be used in group 4
*.
b r:this group can also be used to Set items
*.
-f: c:
*.
%:item1=3  %:item2=5  %:item25=154
 *.
c f:aaaaaaaaaaaaaaaaaaaaasasasasasasasasasasasasasasasasasasasasasasasasasasasasasasasasasas
 *.
d f:asasasasasasasasasasssaaaaasasasasasasasasasasasasasasasasasasasasasasasasasasasaaasa
 FRAME  CAPACITY REACHED. DELETE LINES  TO CONTINUE
 *.
#save done
SAVED
```

IN EITHER OF THESE CASES, THE PROGRAM PERMITS EXECUTION TO CONTINUE AT THE OPTION OF THE USER, BY GOING TO THE NEXT FRAME IN THE LESSON SEQUENCE.

VARIOUS COMBINATIONS OF ACTION COMMANDS AND ITEM SETTINGS AND USES WILL BE DEMONSTRATED DURING LESSON EXECUTION.

THIS COMPLETES THE SECTION ON LESSON BUILDING

NOW THAT WE HAVE PRESENTED THE FEATURES OF GROUP 1 THROUGH 4 CONSTRUCTION FOR THE 'Q', 'M', AND 'D' FRAMES, WE WILL CONSIDER HOW THE CDTS PERMITS A COURSE DESIGNER TO MODIFY HIS LESSON MATERIAL.

LESSON EDITING

THERE ARE TWO BASIC EDITING CAPABILITES PROVIDED WITHIN THE CDTS. THESE ARE INSERTION AND DELETION. A THIRD FEATURE PRINTING, WHILE NOT A LESSON MODIFICATION FEATURE PERMITS THE CD TO QUALITY CONTROL HIS LESSON MODIFICATION WORK.

THE COMMANDS TO ACCOMPLISH THESE ACTIVITIES ARE:

I (INSERT)

THE TRAINING SYSTEM DETERMINES THE LEVEL OF INSERTION DESIRED: FRAME, GROUP, OR LINE AND WHETHER THE INSERTION IS TO OCCUR WITHIN EXISTING MATERIAL OR BE ADDED TO THE LESSON MATERIAL.
IF A SINGLE LINE IS SPECIFIED, THE PROGRAM PRINTS OUT THE REQUESTED LINE FOR EASY REFERENCE AND CHANGES ARE ENTERED. THIS NEW LINE OF INFORMATION REPLACES THE OLD LINE IN THE LESSON.

D (DELETION)

THE TRAINING SYSTEM DETERMINES THE LEVEL OF DELETION FRAMES, GROUPS WITHIN FRAMES, OR LINES WITHIN GROUPS AND REMOVES THE MATERIAL FROM THE LESSON.

P (PRINT)

PERMITS THE ON-LINE PRINTOUT OF SELECTED COURSE MATERIAL BY THE CD FOR VISUAL QUALITY CONTROL. ONLY A RANGE OF THREE (3) FRAMES PER REQUEST CAN BE PRINTED ON-LINE.

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THE GENERAL FORMAT FOR USING THESE COMMANDS IS:

#C, F1-F2, G1-G2, L1-L2

C IS THE COMMAND--I, D, P
F1-F2 ARE FRAME NUMBERS,
G1-G2 ARE GROUP NUMBERS WITHIN A FRAME,
L1-L2 ARE LINE NUMBERS WITHIN A GROUP.

THERE ARE SEVERAL CONDITIONS AND RESTRICTIONS:

1) FRAMES MUST BE SPECIFIED.
2) LINES MAY BE OMITTED IN SOME CASES.
3) GROUPS MAY BE OMITTED IN SOME CASES.
4) IF A LINE IS SPECIFIED, A GROUP MUST BE SPECIFIED.
5) IF A GROUP IS SPECIFIED, A FRAME MUST BE SPECIFIED.
6) INSERTION OF COURSE CONTENT IS RESTRICTED TO A SINGLE FRAME, GROUP OR LINE PER INSERTED COMMAND.
7) A COMMAND MUST BE SPECIFIED.

THESE LEGAL COMMANDS ARE P, I AND -----.
*.
d
YES, D FOR DELETE.
WHAT DOES I STAND FOR
*.
insert
YES, INSERT.
THEN OF COURSE THAT LEAVES P FOR -----.
*.
print
RIGHT
THE INITIAL USE OF AN EDITING COMMAND REQUIRES THE USE OF THE NUMBER SYMBOL (#) PRECEDING THE COMMAND. THEREAFTER, IF SUCCESSIVE EDITING COMMANDS ARE ENTERED, THE # CAN BE OMITTED.
FOR EXAMPLE:

#I 3 2 1 IS THE INITIAL ENTRY INTO EDITING.

D,4,4,5 SUBSEQUENT EDITING COMMAND.

NO SPACE IS PERMITTED BETWEEN THE # AND THE COMMAND WHEREAS A SPACE OR COMMA MUST SEPARATE THE REMAINING ELEMENTS OF THE EXPRESSION.

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NOW, TO DEMONSTRATE AND VERIFY THESE EDITING COMMANDS WE WILL USE THE SERVICES OF THE PERSON AT THE OTHER REMOTE TERMINAL.

A SPECIAL LESSON CALLED 'EDIT' HAS BEEN CONSTRUCTED WHICH WILL SERVE AS THE TEST VEHICLE.

THE CD WILL 'GET' THIS LESSON AND FOLLOWING A SCRIPT PERFORM VARIOUS EDITING. THE INSERT COMMAND WILL BE DEMONSTRATED FIRST (SINCE WE WANT SOMETHING LEFT) AND THEN FOLLOWED BY THE DELETE COMMAND. THE PRINT COMMAND WILL BE VERIFIED BY VISUALLY CHECKING THE RESULTS OF THE OTHER TWO COMMANDS.
AFTER EACH LEGAL EDITING COMMAND, THE PROGRAM WILL OUTPUT:

```
DONE
*.
```

AND AWAIT THE NEXT COMMAND.

THE FIRST SERIES OF INPUTS WILL BE ILLEGAL INSERTIONS. THE PROGRAM OBVIOUSLY DOES NOT PERMIT A LINE TO BE INSERTED INTO A NONEXISTENT FRAME. THE PROGRAM ALSO RESTRICTS THE CD FROM INSERTING A NEW GROUP OVER AN EXISTING GROUP. THE EXISTING GROUP MUST BE 'DELETED' PRIOR TO USING THE INSERT COMMAND.

THE PROGRAM PERMITS THE INSERTION OF A NEW FRAME BUT THE FRAME NUMBER MUST BE LEGAL (I.E., NUMERIC AND LESS THAN 999.9).

THE PROGRAM ALSO RESTRICTS THE USE OF THE INSERT COMMAND TO A SINGLE LINE, GROUP OR FRAME.

FOR EACH ILLEGAL INSERTION ATTEMPT THE PROGRAM WILL OUTPUT AN APPROPRIATE ERROR MESSAGE.

```
'ILLEGAL GROUP/LINE NUMBER'
```

FOR ATTEMPTING TO INSERT A GROUP OR LINE INTO A NONEXISTENT FRAME, THE MESSAGE:

```
'ILLEGAL LABEL OR FRAME NUMBER
```

IS OBVIOUS.

```
#get edit cd
Ø61769
 ALLOW TRAINEE ACCESS?Y/N
Y
ENTER COMMAND
#i 17.5
ILLEGAL GROUP/LINE NUMBER
*.
#i 39.7 3 2
ILLEGAL GROUP/LINE NUMBER
*.
```

```
THE CD WILL ALSO ATTEMPT TO INSERT ILLEGAL LABELS. A LABEL MUST BE
ALPHANUMERIC AND CONTAIN NO MORE THAN ONE THE FOLLOWING RANGES OF
CHARACTERS:
 A Ø-6
B 2-12
C 1-6
D 1-16
*.
c
AFTER EACH ILLEGAL LABEL ATTEMPT OF:
     'ILLEGAL LABEL OR FRAME NUMBER

   LABEL=123456 AND ABCDEFG

THE PROGRAM WILL OUTPUT:

     'ILLEGAL FRAME LABEL'

AND ALLOW THE CD TO MAKE A LEGAL INSERTION IF DESIRED

AFTER THIS HAS BEEN COMPLETED TYPE GO.
*.
go
OK
NOW THE CD WILL ATTEMPT TO INSERT ADDITIONAL INFORMATION INTO A FRAME
 AND EXCEED THE FRAME CAPACITY OF ---------- CHARACTERS.
 *.
4ØØ
VERY GOOD, YOU REMEMBERED.
```

```
 i 24.3 2
 ILLEGAL GROUP/LINE NUMBER
 *.
 i 1234
ILLEGAL LABEL OR FRAME NUMBER
 *.
i 57.3 6
ILLEGAL GROUP/LINE NUMBER
 *.
i, 18-2ø
ILLEGAL LABEL OR FRAME NUMBER
*.
i 4ø 1 1

FRAME  4ø.ø
 Q,M,D
*.
q
FRAME  4ø.ø LABEL
 *.
123456
ILLEGAL FRAME LABEL
 FRAME  4ø.ø LABEL
 *.
abcdefgh
ILLEGAL FRAME LABEL
 FRAME  4ø.ø LABEL
 *.
#i 37 2 7
*.
xasdfdfdfdfdfdfdfdfdfdfdfdfdfdfdfdfdfdfdfdfdfdfdfdfdfdfdfdfdfdfdfdfdfdfdfdfdfdf
 FRAME  CAPACITY REACHED. DELETE LINES  TO CONTINUE
 *.
```

THIS WILL BE FOLLOWED BY THE CONSTRUCTION OF A NEW FRAME WITHIN THE LESSON. FRAME CAPACITY WILL ALSO BE EXCEEDED.

WHEN THE FRAME CAPACITY IS EXCEEDED THE PROGRAM WILL INDICATE:

'CAPACITY REACHED. DELETE LINES TO CONTINUE'

TO VERIFY A LEGAL FRAME CAN BE INSERTED, THE CD WILL CONSTRUCT A DECISION FRAME AND THEN USE THE PRINT COMMAND TO VERIFY THE CONSTRUCTION.

AFTER THIS IS COMPLETED TYPE GO
*.

```
*.
#i 44.5
Q,M,D
*.
q
FRAME  44.5 LABEL
 *.
^
G.2 TEXT
 *.
asasaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaa
 *.
mnmnmnmnmnmnmnmnmnmnmnmnmnmnmnmnmnmnmnmnmnmnmnmnmnmnmnmn
 *.
nbnbnbnbnbnbnbnbnbnbnbnbnbnbnbnbnbnbnbnbnbnbnbnbnbnbnbnbn
 *.
bvbvbvvvbvbvbvbvbvbvbvbvbvbdbvbvbvbvbvbvbvbvbvbvbvbvbvbvbv
 *.
nmnmnmnmnmnmnmnmnmnmnmnmnmnmnmnmnmnmnmnmnmnmnm
 *.
nmnmnmnmnmnmnmnmnmnmnmnmnmnmnmnmnmnmnmnmnmnmnm
 *.
gggghghghghghghghghghghghghghghghghghghghghghghghghghghghg
[illegible]
 [illegible] CAPACITY REACHED. DELETE LINES  TO CONTINUE
 *.
#i 2.5
Q,M,D
*.
d
FRAME   2.5 LABEL
 *.
^
G.2 CONDITIONS
*.
f:this demonstrates inserting a legal decision frome
f:fghjk
*.
$
DONE
*.
#p 2.5

FRAME   2.5

G.2 CONDITIONS
   1.Ø    F:THIS DEMONSTRATES INSERTING A LEGAL DECISION FROME
   2.Ø    F:FGHJK
 DONE
*.
```

go
FINE.
AS DISCUSSED IN LESSON BUILDING, GROUP 1 CAN BE USED TO INSERT LABELS AND DECISION STATEMENT INDICATORS THE CD WILL ATTEMPT TO INSERT A DUPLICATE LABEL, INSERT A NEW LABEL (GOOD) AND REPLACE AN EXISTING LABEL (CHART FOR FLOW).

FOR THE DUPLICATE LABEL ATTEMPT, THE PROGRAM WILL INDICATE:

'FRAME 39.Ø IS USING THAT LABEL'

AND THEN ALLOW THE CD TO INSERT LABEL--GOOD.

AFTER THE CD VERIFIES THE REPLACEMENT OF LABEL FLOW WITH CHART BY PRINTING GROUP 2, TYPE OK.
*.
ok
OK IS OK.
THE CD WILL ATTEMPT TO INSERT AN ILLEGAL FRAME TYPE (X) AND RECEIVE THE MESSAGE:

'ILLEGAL FRAME TYPE - ONLY Q/M/D CAN BE INSERTED'

Q,M,D
*.

YOU WILL NOTE THAT ONE FRAME TYPE--COPY IS MISSING. THE PROGRAM DOES NOT PERMIT THE COPY FRAME TO BE INSERTED. IT CAN ONLY BE USED WHEN BUILDING A LESSON IN A SEQUENTIAL MANNER.

THE ATEMPT TO INSERT 'BRANCH TO 1Ø6' AND 'WRONG FORMAT' INTO A DECISION FRAME WILL TRIGGER THE MESSAGE:

'REJECTED. ALL DECISION STATEMENTS MUST BEGIN WITH IF, AND, OR, END, F:, B , ELSE OR % '

```
#i 4Ø 1

FRAME  4Ø.Ø
 Q,M,D
*.
q
FRAME  4Ø.Ø LABEL
 *.
flow
FRAME  39.Ø IS USING THAT LABEL.
 FRAME  4Ø.Ø LABEL
 *.
good
DONE
*.
#i 39 1

FRAME  39.Ø        LABEL= FLOW
  Q,M,D
*.
q
FRAME  39.Ø LABEL
 *.
chart
DONE
*.
#p 39 1

FRAME  39.Ø        LABEL= CHART
 DONE
*.
#i 84.5
Q,M,D
*.
x
ILLEGAL FRAME TYPE - ONLY Q/M/D   CAN BE INSERTED
  Q,M,D
*.
#i 34 2 5
B:1Ø6
*.
branch to 1Ø6
 REJECTED.  ALL DECISION STATEMENTS MUST BEGIN WITH IF, AND, OR, END, F:, B:, ELSE OR %:
*.
wrong format
 REJECTED.  ALL DECISION STATEMENTS MUST BEGIN WITH IF, AND, OR, END, F:, B:, ELSE OR %:
*.
```

```
THIS WILL BE FOLLOWED BY THE INSERTION OF 'B:12Ø' WHICH IS A LEGAL
DECISION STATEMENT.

TYPE FINE AFTER THIS ACTIVITY HAS BEEN COMPLETED.
 *.
fine
GOOD, LET'S PROCEED.
THE NEXT SEQUENCE OF EVENTS WILL BE

   A) THREE ATEMPTS TO INSERT SERVICE FUNCTIONS ILLEGALLY,
    B) INSERTION AND VERIFICATION OF A LEGAL SERVICE FUNCTION,
   C) TWO ATTEMPTS TO INSERT ILLEGAL GROUP 3 FORMATS AND,
    D) INSERTION AND VERIFICATION OF A LEGAL ANSWER TAG-RESPONSE.

FOR THE ILLEGAL SERVICE FUNCTION THE PROGRAM WILL INDICATE:

     'ILLEGAL SERVICE FUNCTION WAS INPUT'

AND FOR THE IMPROPER GROUP 3 FORMAT, THE MESSAGE:

     'ILLEGAL SECOND CHARACTER'

WILL BE OUTPUT.

THE PROGRAM ASSUMES A SERVICE FUNCTION IS BEING ENTERED WHEN A NUMERIC
 TAG IS USED AND PROCESSES THE LINE ACCORDINGLY. WHEN AN ALPHABETICAL
TAG IS USED THE PROGRAM EXPECTS TO FIND AS THE SECOND CHARACTER IN
THE LINE OF INPUT A BLANK OR:
A #
B +
C/

D $
*.
b
RIGHT.
AFTER THE LEGAL GROUP 3 FORMAT HAS BEEN VERIFIED BY THE PRINTING OF:

     G.3 ANSWERS
     2.Ø B M
     DONE
     *.
TYPE CONTINUE.
  *.
```

```
b:12Ø
DONE
*.
#p 34 2 5

G.2 CONDITIONS
   5.Ø   B:12Ø
 DONE

*.
#1 52 3 2
*.
4 key
ILLEGAL SERVICE FUNCTION WAS INPUT
 *.
Ø phonetia on
ILLEGAL SERVICE FUNCTION WAS INPUT
 *.
22 order on
 ILLEGAL SERVICE FUNCTION WAS INPUT
 *.
Ø order on
DONE
*.
#p 52 3 2

G.3 ANSWERS
  2.Ø   Ø ORDER ON
 DONE
*.
#1 32 3 2
 *.
b1
ILLEGAL SECOND CHARACTER
  *.
c-false
ILLEGAL SECOND CHARACTER
 *.
b m
DONE
*.
p 32 3 2
G.3 ANSWERS
 2.Ø    B M
 DONE
*.
```

continue
LET'S DO.
THE CD WILL MAKE FIVE ATTEMPTS TO CHANGE AN EXISTING LINE OF MATERIAL.
IN EACH CASE, THE PROGRAM PRINTS OUT THE LINE TO BE MODIFIED FOR
VISUAL INSPECTION AND REFERENCE. ONCE A SINGLE CHARACTER HAS BEEN
ENTERED, THE ENTIRE LINE HAS BEEN REPLACED.

THE CD CAN 'CHANGE HIS MIND' AND VOID THE REQUEST BY INSERTING ANOTHER
EDITING COMMAND PRECEDED BY THE # SYMBOL. THIS PRESERVES THE LINE OF
INFORMATION IN THE LESSON IN ITS CURRENT STATE.

AFTER EACH INSERTION, THE CD WILL USE THE PRINT COMMAND TO VERIFY THE
CHANGE. THE PRINT COMMAND IS -----.
*.

p
VERY GOOD

```
#i 73 4 2
 -F:
*.
-r:
DONE
*.
#p 73

FRAME  73.Ø

G.2 TEXT
  1.Ø   CHANGED

G.3 ANSWERS
  1.Ø   A+CUSTOMER

G.4 ACTIONS
  1.Ø   A F:
   2.Ø   -R:
 DONE
*.
#i 85.3 3 8
 E DESIGN
 *.
e designer
DONE
*.
85.3 3 8

G.3 ANSWERS
  8.Ø   E DESIGNER
 DONE
*.
#i 37 2 2
 TO DEFINE THE PROBLEM.
 *.
to define a particular problem
DONE
*.
37 2 1-2

G.2 TEXT
  1.Ø   THE CUSTOMER/USER METS WITH A FORMULATOR (F) IN AN ATTEMPT
  2.Ø   TO DEFINE A PARTICULAR PROBLEM
 DONE
*.
```

AFTER VERIFYING THAT 'A F GOOD' WAS INSERTED, TYPE GO.
*.
go
GOOD.
THE LAST AREA OF INSERTION DEMONSTRATED WILL BE TO MODIFY THE FRAME
TYPE AND ADD OR DELETE THE DECISION FRAME INDICATOR.

TO DO THIS THE CD MUST MODIFY GROUP -----.
*.
2
NO GROUP 1 IS WHERE THIS INFORMATION IS MAINTAINED.
THE FRAME TYPE AND DECISION FRAME INDICATOR CANNOT BE VERIFIED VISUAL-
LY BY PRINTING THE GROUP 1 OF A FRAME ON-LINE. ONLY THE FRAME NUMBER
AND LABEL (IF ANY) ARE PRINTED BY THE PROGRAM ON-LINE. FRAME TYPE CAN
BE DEDUCED BY EXAIMING THE GROUP CUES

G.2 TEXT = 'Q' OR 'M'
G.2 CONDITIONS = 'D'

OR BY EXECUTING THE FRAME. THE GROUP 3 OF AN 'M' FRAME WILL PRINT
WHEREAS THE GROUP 3 OF THE 'Q' FRAME WILL NOT.

ALL GROUP 1 INFORMATION IS PRINTED WHEN THE LESSON IS LISTED OFF-LINE.

AFTER THE CD HAS COMPLETED MODIFYING SEVERAL GROUP 1'S, THE INSERT TEST
WILL BE COMPLETED. TYPE 'DELETE' TO CONTINUE.
*.
delete
FINE. ON TO DELETE.

```
#1 39.5 4 1
*.
a f:good
DONE
*.
39.5 4 1

G.4 ACTIONS
  1.Ø   A F:GOOD
DONE
*.
#1 3 1

FRAME   3.Ø
 Q,M,D
*.
m
FRAME   3.Ø LABEL
 *.
^
DONE
*.
#1 2 1

FRAME   2.Ø
 Q,M,D
*.
qq
FRAME   2.Ø LABEL
 *.
Z
DONE
*.
#1 1 1

FRAME   1.Ø          LABEL= COØ6ØØ
 Q,M,D
*.
m1
FRAME   1.Ø LABEL
 *.
^
DONE
*.
```

THE PROGRAM ACCEPTS INPUTS TO DELETE NONEXISTENT FRAMES, GROUPS OR LINES. WHEN THIS OCCURS, THE PROGRAM WILL OUTPUT:

```
'DONE'
*.
```

INDICATING IT HAS PROCESSED THE REQUEST. IN THIS CASE NOTHING HAS BEEN DONE TO THE LESSON. HOWEVER, THE CD MUST EXERCISE CAUTION WHEN USING THE DELETE COMMAND SINCE ONCE INPUT THERE IS NO TURNING BACK. UNLIKE THE INSERT COMMAND, THE CD CANNOT RETRACT OR 'CHANGE HIS MIND' AND INPUT ANOTHER EDIT COMMAND.

THE CD WILL VERIFY THE ABILITY OF THE PROGRAM TO DELETE EXISTING MATERIAL BY USING THE PRINT COMMAND BEFORE AND AFTER EACH DELETION.

UNLIKE THE INSERT COMMAND, THE PROGRAM HAS NO RESTRICTION ON THE RANGE OF FRAMES WHICH CAN BE DELETED. THE PROGRAM WILL DELETE THE ENTIRE LESSON, IF DESIRED, ALTHOUGH NOT RECOMMENDED. AGAIN, AFTER EACH DELETE THE PROGRAM INDICATES

```
'DONE'
*.
```

```
#d 89.5
DONE
*.
17-19

FRAME  17.Ø

G.2 TEXT
  1.Ø   DIAGRAM 3 OF YOUR EXHIBIT ILLUSTRATES A ------- -------? (TWO WORDS)

G.3 ANSWERS
  1.Ø   A+FLOW CHART
   2.Ø   B+FLOW DIAGRAM
  3.Ø   C+BLOCK DIAGRAM
   4.Ø   A+FLOW CHARTING
   5.Ø   B+FLOW DIAGRAMMING
   6.Ø   C+BLOCK DIAGRAMMING

FRAME  18.Ø

G.2 TEXT
  1.Ø   THE GRAPHIC REPRESENTATION OF 'HOW' VARIOUS PROCEDURES AND
   2.Ø   DECISIONS ACCOMPLISH THE TASK OF THE PROGRAM SYSTEM IS CALLED
    3.Ø   A ---------- FLOW CHART.

G.3 ANSWERS
  1.Ø   Ø PHONETIC OFF
   2.Ø   A+PROGRAM
   3.Ø   B+MICRO
   4.Ø   C+DETAILED
   5.Ø   D+SPECIFIC

FRAME  19.Ø

G.2 TEXT
  1.Ø   THE GRAPHIC REPRESENTATION OF 'WHAT' IS TO BE ACCOMPLISHED
  2.Ø   DURING THE FLOW OF DATA THROUGH A PROGRAMMING SYSTEM IS
   3.Ø   CALLED A ---------- FLOW CHART.

G.3 ANSWERS
  1.Ø   Ø SET KEYWORD ON
   2.Ø   Ø PHONETIC OFF
   3.Ø   E+SYSTEM (GENERALIZED)
   4.Ø   A+SYSTEM
   5.Ø   B+MACRO
   6.Ø   C+GENERAL
   7.Ø   D+GENERALIZED
 DONE
*.
```

ONE RESTRICTION THE CD WILL DEMONSTRATE IS THE ATTEMPT TO DELETE A GROUP 1 FROM AN EXISTING FRAME. THE PROGRAM WILL OUTPUT:

'GROUP 1 WAS USED WITH A DELETE COMMAND'

THE CD WILL CONTINUE TO DEMONSTRATE THE ABILITY OF THE PROGRAM TO DELETE FRAMES, GROUPS WITHIN FRAMES AND LINES WITHIN GROUPS.

```
#d 17-19
DONE
*.
17-19
DONE
*.
#d 23.1-23.9
DONE
*.
#d 54 1
GROUP 1 WAS USED WITH A DELETE COMMAND
 *.


43.5 3

G.3 ANSWERS
   1.Ø    A+FORMULATOR (F)
    2.Ø    A+FORMULATOR
DONE
*.
#d 43.5 3
DONE
*.
43.5 3
DONE

*.
43.5

FRAME  43.5

G.2 TEXT
  1.Ø   2)  # ----------
```


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```
G.4 ACTIONS
  1.Ø   A F:
   2.Ø   -F: C:
 DONE
*.
47h6 2

G.2 TEXT
  1.Ø   ALL OF THESE PEOPLE QUITTE NATURALLY HAVE A CORRESPONDING AIR
   2.Ø   FORCE SPECIALITY (AFS).

  3.Ø   A FORMULATOR IS TERMED A FUNCTIONAL AREA ANALYST.
   4.Ø   A DATA SYSTEMS ANALYST IS THE SPECIALTY WHICH DOES THE JOB
   5.Ø   OF THE ---------- .
 DONE
*.
#d 46 2
DONE
*.
46

FRAME  46.Ø          LABEL= AFS
DONE
*.
46.5 4

G.4 ACTIONS
  1.Ø   A F:
  2.Ø   -F: C:
 DONE
*.
#d 46.5 4
DONE
*.
46.5 4
DONE
*.
47 3-4

G.3 ANSWERS
  1.Ø   A+CODER

G.4 ACTIONS
  1.Ø   A F:
  2.Ø   -F: C:
DONE
*.
#d 47 3-4
 DONE
*.
```


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```
47

FRAME  47.Ø

G.2 TEXT
  1.Ø   THE PROGRAMMER SPECIALIST PERFORMS THE SAME JOB AS THE ---------- .
 DONE
*.
55 2 2-3

G.2 TEXT
  2.Ø   'WHAT' IS TO BE DONE.....THE OTHER GETS DOWN TO THE
   3.Ø   SPECIFICS AND SHOWS 'HOW' IT WILL BE ACCOMPLISHED.

DONE
*.
#d 55 2 2-3
DONE
*.
55   2 1-4

G.2 TEXT
  1.Ø   THERE ARE TWO TYPES OF FLOW CHARTS.  ONE TYPE ILLUSTRATES
  4.Ø   THE TWO TYPES CAN BE THOUGHT OF AS BEING A GENERAL FLOW AND
 DONE
*.
55.5 3 2-3

G.3 ANSWERS
  2.Ø   C+DETAILED
   3.Ø   A+MICRO
 DONE
*.
#d 55.5 3 2-3
DONE
*.
55.5 3 1-4

G.3 ANSWERS
  1.Ø   Ø PHONETIC OFF
   4.Ø   B+SPECIFIC
 DONE
*.
```

```
WHEN THIS ACTIVITY IS COMPLETED, TYPE END.
 *.
end
VERY GOOD.
NOW, SELECT ONE OF THE FOLLOWUNG.
A I WISH TO BRANCH TO THE NEXT TEST
B I WISH TO TAKE A BREAK.
*.
b
PLEASE TYPE *CLOSE.
*.
```

End of Day 2 Formal Qualification Testing

Trainee

```
7Ø.6 4 5-6

G.4 ACTIONS
  5.Ø    E B:ADV
   6.Ø    F B:SYMB
 DONE
*.
#d 7Ø.6 4 5-6
DONE
*.
7Ø.6 4 4-7

G.4 ACTIONS
  4.Ø    D B:TYPES
   7.Ø    G F:O.K., ON WITH THE QUESTIONS. B:72
 DONE
*.
```

End of Day 2 Formal Qualification Testing

Course Designer

*open for e 161952722
ENTER INITIAL COMMAND TO CDTS.
?get demoØ2 salvage
Ø69168

THE SAVE COMMAND
****

THE SAVE COMMAND ALLOWS THE COURSE DESIGNER TO SAVE, ONTO DISK STORAGE, THE LABEL INFORMATION AND FRAME DIRECTORY OF THE LESSON BEING CONSTRUCTED, AND ALLOWS HIM TO ACCESS A DIFFERENT LESSON.
(VIA THE GET OR Co COMMANDS)

THERE ARE ACTUALLY TWO FORMS OF THE SAVE COMMAND
1) SAVE
2) SAVE DONE

A SIMPLE "SAVE" INSURES THAT ALL DATA FOR THE LESSON BEING CONSTRUCTED IS SAVED ONTO DISK, TO PROTECT AGAINST A COMPUTER OR PROGRAM FAILURE CAUSING THIS INFORMATION TO BE LOST. THE SIMPLE SAVE SHOULD BE EXECUTED AT PERIODIC INTERVALS TO MINIMIZE LOSS OF EFFORT.

THE "SAVE DONE" COMMAND IS USED BY THE COURSE DESIGNER TO INDICATE TO CDTS THAT NOT ONLY DOES HE WANT HIS LESSON MATERIAL "SAVED", BUT ALSO THAT HE HAS COMPLETED WORK ON THIS LESSON FOR THE TIME BEING.

IF A COURSE DESIGNER DECIDES THAT HE WISHES TO TERMINATE CONSTRUCTING OR MODIFYING A PARTICULAR LESSON AND GET ANOTHER, HE WOULD INPUT THE:
A SAVE COMMAND
B SAVE DONE COMMAND
*.
b
FROM THE ABOVE DISCUSSION IT IS OBVIOUS THAT THE SAVE COMMAND SHOULD NOT BE A LEGAL INPUT TO THE SYSTEM FROM A STUDENT. TO VERIFY THAT SUCH ATTEMPTS BY USERS IN A STUDENT STATUS WILL BE REJECTED, YOU SHOULD ATTEMPT TO INPUT BOTH A "#SAVE" AND A "?SAVE" COMMAND.

THE SYSTEM WILL RESPOND TO THE #SAVE INPUT WITH THE MESSAGE "ILLEGAL USE OF SYMBOL", INDICATING THAT CDTS WILL NOT PERMIT A STUDENT TO INPUT ANY COMMAND PRECEDED BY THE # SYMBOL, WHICH IS RESERVED FOR COURSE DESIGNER USE.

YOUR ATTEMPT TO INPUT A ?SAVE COMMAND WILL BE REJECTED WITH THE MESSAGE "UNDEFINED COMMAND/OPTION" INDICATING THAT ?SAVE HAS NO MEANING TO THE SYSTEM.

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(AFTER TRYING THESE ILLEGAL COMMANDS, TYPE "MOVE ON" AND WE WILL MOVE ON TO EXAMINE THE USE OF THE SAVE COMMAND BY THE COURSE DESIGNER.)

*.
?save
UNDEFINED COMMAND/OPTION
#save
ILLEGAL STUDENT USE OF #
MOVE ON
ONCE AGAIN A USER AT ANOTHER REMOTE TERMINAL WILL BE USED TO DEMONSTRATE THE CAPABILITIES AVAILABLE TO THE CD. WHEN HE HAS ACCESSED A DEMONSTRATION LESSON IDENTIFIED AS "DEMOØ2", HE WILL ATTEMPT THE FOLLOWING ACTIONS:
  1)EXECUTING A "SAVE DONE" COMMAND WHILE HE IS IN THE ROLE OF A PSEUDO TRAINEE. THIS MEANS THAT HE WILL EXECUTE A FRAME OR TWO VIA THE "EX" COMMAND (WHICH WILL BE EXPLAINED IN DETAIL AT A LATER TIME) AND THEN INPUT THE SAVE DONE.

THIS SITUATION WOULD OCCUR WHEN THE CD HAS ALREADY MODIFIED A LESSON THROUGH THE EDITING CAPABILITY, AND HAS EXECUTED SOME PORTION OF IT
IN ORDER TO -------- THE LOGIC. (TYPE IN A SINGLE LETER
A VERIFY
B CHECK OUT
C SIMPLIFY
*.
a
RIGHT - THE LOGIC AND FLOW OF A CDTS LESSON MUST BE VERIFIED JUST AS WITH A COMPUTER PROGRAM.

WHEN THE CD HAS RECEIVED THE "SAVED" MESSAGE, TYPE IN "SAVED" AT THIS TERMINAL AND HE WILL EXECUTE UNDER A SECOND CONDITION.
*.
saved

```
#get demoØ2 9z
Ø61869
ALLOW TRAINEE ACCESS?Y/N
Y
ENTER COMMAND
#ex 89.5
IN ORDER TO -------- THE LOGIC. (TYPE IN A SINGLE LETTER
A VERIFY
B CHECK OUT
C SIMPLIFY
*.
#save
SAVED
```

2)THE SECOND EXAMPLE OF THE USE OF THE SAVE COMMAND WILL INVOLVE THE INPUT OF A SAVE DONE COMMAND IMMEDIATELY FOLLOWING A SAVE COMMAND FOR THE SAME LESSON. THE PURPOSE OF THIS COMBINATION OF ACTIONS IS TO DEMONSTRATE THAT CDTS CAN HANDLE THE SITUATION WHERE THE CD INADEVERTANTLY INPUTS A SAVE COMMAND WITHOUT THE DONE PARAMETER.

AFTER THE OUTPUT OF THE 'SAVED' MESSAGE AT THE OTHER TERMINAL, TYPE IN 'SAVE DONE' AT THIS REMOTE AND WE WILL VERIFY THAT DATA IS INDEED 'SAVED' ONTO DISK.
*.
save done
TO VERIFY THAT THE MATERIAL HAS BEEN PROPERLY SAVED, THE CD WILL USE THE PRINT COMMAND TO PULL THE NEW AND CHANGED FRAMES OFF OF DISK AND DISPLAY THEM AT HIS TERMINAL.

TYPE IN "DONE" AFTER THE MATERIAL IS PRINTED.
*.

done

THE STATUS COMMAND

THE STATUS COMMAND PERMITS THE COURSE DESIGNER TO DETERMINE THE CURRENT CONDITIONAL STATE OF THE OPTIONAL FUNCTIONS:

PHONETIC
ORDER
KEYWORD

THIS CAN BE VERY USEFUL TO A COURSE DESIGNER EITHER WHEN HE IS BUILDING A LESSON AND HAS 'LOST' TRACK OF THE STATUS OF THESE SERVICE

FUNCTIONS OR IS EXECUTING A LESSON AS A PSEUDO TRAINEE AND IS HAVING SOME DIFFICULTY IN QUALITY CONTROLLING THE LESSON.

IN THE LATTER CASE, THE COURSE DESIGNER MAY WISH TO TEST THE CORRECT AS WELL AS SEVERAL INCORRECT OR UNANTICIPATED RESPONSES TO SEE THE REACTION WITHIN THE PARTICULAR FRAME. DETERMINING THE STATUS OF THE PARTICULAR SERVICE FUNCTION ASSISTS THE COURSE DESIGNER IN ESTABLISHING THE BEST ANSWER PROCESSING CRITERIA FOR A GIVEN FRAME OR SET OF FRAMES.

TO USE THIS COMMAND, THE USER MUST BE A COURSE DESIGNER WHO HAS ACCESSED A LESSON.

```
#ex 89.5
IN ORDER TO -------- THE LOGIC. (TYPE IN A SINGLE LETTER
A VERIFY
B CHECK OUT
C SIMPLIFY
*.
#save done
SAVED
#get demoØ2 9z
Ø61869
ALLOW TRAINEE ACCESS?Y/N
Y
ENTER COMMAND
 #1 91 2 2
 AFTER THE OUTPUT OF THE 'ENTER INITIAL COMMAND' MESSAGE AT THE OTHER
 *.
 after the output of the 'saved' message at the other
  DONE
  *.
#save
SAVED
91 2 2

G.2 TEXT
   2.Ø   AFTER THE OUTPUT OF THE 'SAVED' MESSAGE AT THE OTHER
DONE
*.
#save done
SAVED
```

THE COURSE DESIGNER INPUTS:

#STATUS

THE PROGRAM READS THE SERVICE FUNCTION TABLE AND OUTPUTS THE CURRENT STATUS OF PHONETIC, ORDER, AND KEYWORD.

THE PROGRAM INDICATES WHETHER THE SERVICE FUNCTION IS 'ON' OR 'OFF', BUT DOES NOT INDICATE WHETHER A PARTICULAR SERVICE FUNCTION HAS BEEN 'SET' ON. THIS MUST BE DETERMINED BY THE COURSE DESIGNER REVIEWING A PRINTOUT OF THE LESSON.

TO VERIFY THAT THIS COMMAND IS NOT AVAILABLE TO A STUDENT, FIRST TYPE

#STATUS

AFTER THIS HAS BEEN DONE AND THE ERROR MESSAGE:

ILLEGAL STUDENT USE OF #

HAS BEEN OUTPUT, TYPE IN GO.

```
*.
#status
ILLEGAL STUDENT USE OF #
GO
VERY GOOD.
NOW, INPUT THE COMMAND PRECEDED BY A QUESTION MARK
```

?STATUS

THIS WILL CAUSE THE ERROR MESSAGE:

UNDEFINED COMMAND/OPTION

TO BE OUTPUT.

AGAIN, AFTER THE ERROR MESSAGE HAS BEEN OUTPUT, TYPE GO

```
*.
?status
UNDEFINED COMMAND/OPTION
GO
FINE, LET' MOVE OUT.
```

IN THIS CASE, THE PROGRAM ACCEPTS THE USE OF THE QUESTION MARK BY THE STUDENT, BUT THE WORD 'STATUS' IS NOT A LEGAL OPTION AND THE PROGRAM REJECTS THE INPUT AS ILLEGAL.

```
#status
PHONETIC-ON  ,ORDER-OFF  ,KEYWORD-OFF
#ex 55.5
*.
#status
PHONETIC-ON  ,ORDER-OFF  ,KEYWORD-OFF
#i 55.5 3 1
*.
ø phonetic off
DONE
*.
#save
SAVED
#status
PHONETIC-OFF  ,ORDER-OFF  ,KEYWORD-OFF
```

RESTART
****

THE CDTS COMMAND THAT IS PROBABLY USED THE LEAST BY THE COURSE DESIGNER IS THE "RESTART". THIS COMMAND PERMITS THE DISK SPACE BEING OCCUPIED BY AN UNWANTED LESSON TO BE MADE AVAILABLE FOR THE GENERATION OF A NEW LESSON. IT ALSO DELETES THE LESSON NAME FROM THE TABLE OF CONTENTS, MAKING THE NAME AVAILABLE AT ANY FUTURE TIME.

TO RESTART A LESSON, THE COURSE DESIGNER NATURALLY MUST HAVE PREVIOUSLY ACCESSED THE LESSON THROUGH THE --- COMMAND.

*.
get
VERY GOOD, YOU REMEMBERED.
TO VERIFY THAT THE GET COMMAND IS REQUIRED PRIOR TO THE RESTART, THE SYSTEM USER AT THE OTHER TERMINAL WILL ATTEMPT TO RESTART THIS LESSON (DEMO∅2) WITHOUT HAVING ACCESS TO IT.

WHEN THIS ACTION HAS BEEN TAKEN AND THE MESSAGE "ILLEGAL FIRST COMMAND" APPEARS, TYPE IN "DONE" AND WE WILL PROCEED TO DEMONSTRATE THE PROPER FUNCTIONING OF THE RESTART REQUEST.
*.
done
OK. THIS WILL REQUIRE A COUPLE OF ACTIONS FROM YOUR TERMINAL.

SINCE WE NATURALLY DO NOT WANT TO BLOW UP THIS DEMONSTRATION OF CDTS CAPABILITIES, WE CANNOT PERMIT THE SYSTEM USER AT THE OTHER TERMINAL TO RESTART THE LESSON YOU ARE EXECUTING. IT WILL BE NECESSARY FOR YOU TO GET A DUMMY LESSON WHICH HAS BEEN IDENTIFIED AS "DUMMY".
THE PROPER SEQUENCE OF ACTIONS TO ACCOMPLISH THIS SWITCH IS:
A 1 *CLOSE 2 ?GET DUMMY LASTNAME
B 1 ?QUIT   2 ?GET DUMMY LASTNAME
C 1 *OPEN   2 ?GET DUMMY LASTNAME
*.
b
NEGATIVE
BEFORE YOU EXECUTE THESE TWO COMMANDS, LET'S OUTLINE WHAT SHOULD OCCUR AFTER YOU GET THE "DUMMY" LESSON.

```
#restart
ILLEGAL FIRST COMMAND
```

A LINE OF TEXT WILL BE PRINTED, AND THEN THE USER AT THE OTHER TERMINAL WILL ALSO GET THE LESSON, AND IDENTIFY HIMSELF AS THE CD, USING AN ID OF "DF". ONCE HE HAS ACCESSED THE LESSON HE WILL RESTART IT AND TWO ACTIONS WILL RESULT:

1 THE COURSE DESIGNER WILL RECEIVE THE MESSAGE "GONE ENTER INITIAL COMMAND."

2) THIS TERMINAL WILL RECEIVE THE MESSAGE "LESSON REMOVED FROM DISK BY CD".

THESE MESSAGES INDICATE TO THE USERS THAT THE LESSON NAME HAS BEEN REMOVED FROM THE LESSON FILE TABLE OF CONTENTS, WHICH MEANS THAT IT:

A CAN NO LONGER BE EXECUTED
B CAN BE EXECUTED ONLY BY THE COURSE DESIGNER
*.
a
CHECK
TO VERIFY THAT THE LESSON NAME HAS BEEN ELIMINATED FROM THE SYSTEM, YOU ARE TO ATTEMPT TO "GET" THE LESSON AGAIN, FOLLOWING THE "LESSON REMOVED" MESSAGE. YOU WILL THEN RECEIVE A "LESSON NOT ON DISK" INDICATION.

OK, WE ARE FINALLY READY TO DEMONSTRATE THE RESTART. FIND THE PORTION OF YOUR PRINTOUT LABELLED "RESTART" AND EXECUTE THE SEQUENCE OF EVENTS BEGINNING WITH THE "?QUIT" COMMAND. WHEN YOU HAVE VERIFIED THAT LESSON "DUMMY" IS NOT ON DISK, TYPE "?GET DEMOØ2 LASTNAME" AND TYPE IN "VERIFIED". WE WILL THEN CONSIDER ANOTHER CDTS COMMAND.

?quit
ENTER INITIAL COMMAND
?get dummy1 salvage
Ø61869
THIS IS FRAME ONE, TYPE TWO
*.
two
LESSON REMOVED FROM DISK BY CD
?get dummy1 tooley
LESSON NOT ON DISK
?get demoØ2 salvage
Ø61869
"VERIFIED". WE WILL THEN CONSIDER ANOTHER CDTS COMMAND.
*.

```
#get dummy1 rc
Ø61869
ALLOW TRAINEE ACCESS?Y/N
Y
ENTER COMMAND
#p 1 1

FRAME   1.Ø         LABEL= BLURP
DONE
*.
#restart
GONE,ENTER INITIAL COMMAND
#get dummy1 rc
LESSON NOT ON DISK
```

verified

THE EX (EXECUTE) COMMAND
****

THE EX COMMAND IS ANOTHER COMMAND WHICH IS RESTRICTED TO COURSE DESIGNER USE. THE COMMAND PERMITS THE CD TO EXECUTE ANY PORTION OF HIS LESSON. HE IS PLACED IN A "PSEUDO TRAINEE" STATUS, RATHER THAN A TRAINEE STATUS, WHICH PERMITS HIM A MUCH LARGER DEGREE OF FREEDOM DURING EXECUTION. HE CAN INTERRUPT THE SEQUENCE OF FRAMES BEING EXECUTED AND CAN EXAMINE THE FUNCTIONING OF AN ENTIRELY UNRELATED SET OF FRAMES IF HE SO DESIRES. HE CAN REPEATEDLY EXECUTE THE SAME SET OF FRAMES WITH DIFFERENT COMBINATIONS OF RIGHT AND WRONG ANSWERS, IN ORDER TO VERIFY THE LESSON LOGIC BEFORE IT IS EXECUTED BY AN ACTUAL.
A STUDENT
B TRAINEE
C OPERATOR
*.
b
RIGHT
THE FORMAT OF THE EX COMMAND IS SIMPLY "#EX DDD.D", WHERE DDD.D IS AN EXISTING FRAME NUMBER WITHIN THE LESSON.

ONCE AGAIN, YOU CANNOT LEGALLY INPUT THE EX COMMAND FROM THIS TERMINAL, DUE TO YOUR "TRAINEE" STATUS.

TO VERIFY THAT AN ATTEMPT ON YOUR PART TO INPUT AN EX WILL BE REJECTED----TRY IT. YOU WILL RECEIVE EITHER THE ILLEGAL STUDENT USE OF #, OR UNDEFINED COMMAND/OPTION MESSAGE, DEPENDING UPON WHETHER YOU PRECEDED THE COMMAND WITH A "#" OR "?".

AFTER PROVING THAT YOU (AS A STUDENT) CANNOT 'EX', TYPE IN GO AND WE SHALL CONSIDER WHAT HAPPENS WHEN THE COURSE DESIGNER PROPERLY USES THE COMMAND.

*.
#ex 3Ø4.5
ILLEGAL STUDENT USE OF #
?ex 3Ø4.5
UNDEFINED COMMAND/OPTION
GO
THE COURSE DESIGNER ACTUALLY MUST CONFORM TO TWO SYSTEM RESTRICTIONS, OR HIS EX COMMAND WILL ALSO BE CONSIDERED AS BEING ILLEGAL. HE MUST BE ASSOCIATED WITH A LESSON (VIA THE GET OR CO COMMANDS) AND MUST ATTEMPT TO EXECUTE FRAMES THAT:

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A ARE LABELLED
 B HAVE ALL FOUR GROUPS
C EXIST WITHIN THE LESSON
*.
c
TRUE
THE COURSE DESIGNER AT THE OTHER TERMINAL WILL NOW DEMONSTRATE THESE ILLEGAL ACTIONS. HE WILL FIRST ATTEMPT TO INPUT THE EX COMMAND WHEN HE IS NOT ASSOCIATED WITH A LESSON, WHICH WILL CAUSE A MESSAGE INDICATING THAT THIS IS AN "ILLEGAL FIRST COMMAND."

AFTER HE HAS SUCCESSFULLY ACCESSED THE TEST LESSON, THE CD WILL ATTEMPT TO EX A NONEXISTENT FRAME. THIS ACTION WILL RESULT IN THE 'NO SUCH FRAME OR LABEL' MESSAGE. (HOPEFULLY THIS IS THE ONLY TIME HE WILL SELECT A NON-EXISTANT FRAME.)

AFTER THESE TWO ERROR CONDITIONS HAVE BEEN DEMONSTRATED, TYPE IN "READY TO EX" AND THE CD WILL DEMONSTRATE THE PROPER USE OF THIS COMMAND.
*.
ready to ex
OK, LET'S DO IT.
WHEN THE CD HAS ACCESSED THE LESSON FOR THIS DEMONSTRATION, HE WILL ATTEMPT TO EX FRAME 31ø.ø.

TO DEMONSTRATE CDTS CAPABILITY TO EX FROM A FRAME LABEL, THE CD WILL INPUT #EX KEYWOR.

FOLLOWING THIS DISPLAY, TYPE IN "OK".
*.
ok
OK

NOW THE CD WILL SELECT FIVE NUMBERS AND LABELS FROM THE LISTING OF THE LESSON, AND WILL VERIFY THE COMMAND WILL HANDLE ANY LEGAL INPUT. AT ONE POINT IN THE SEQUENCE THE SAME FRAME NUMBER WILL BE INPUT TWICE IN A ROW, TO PROVE THAT THE PROGRAM CAN HANDLE THAT CONTINGENCY.

#ex 310
ILLEGAL FIRST COMMAND
#get demoØ2 9z
Ø61869
ALLOW TRAINEE ACCESS?Y/N
Y
ENTER COMMAND
#ex 1.5
NO SUCH FRAME/LABEL
#ex 31Ø
AFTER THESE TWO ERROR CONDITIONS HAVE BEEN DEMONSTRATED, TYPE IN
"READY TO EX" AND THE CD WILL DEMONSTRATE THE PROPER USE OF
THIS COMMAND.
*.
#ex f363
THIS IS FRAME 363, WHICH IS AN M FRAME, AND IS LABELED "F363". THIS
FRAME WILL CONTAIN ONLY THE GROUP TWO, AND WILL BE FOLLOWED BY ANOTHER
M FRAME CONTAINING ONLY A GROUP TWO. THE TWO FRAMES WILL THEN BE
FOLLOWED BY AN M FRAME CONTAINING A GROUP 3, BUT NO GROUP 2.

THIS IS FRAME 364, WHICH ALSO CONTAINS ONLY A GROUP 2. WHAT DO YOU
SUPPOSE WE ARE TRYING TO PROVE BY SPLITTING THIS GROUP 2 FROM THE
GROUP 3 WHICH IS ASSOCIATED WITH IT, BUT APPEARS IN THE NEXT FRAME?

A THAT ARBITRARY SPLITS OF GROUPS BETWEEN FRAMES CAN BE MADE
B THAT M FRAMES ARE EASY TO BUILD
C THAT YOU CAN STILL BUILD M FRAMES WHEN TEXT NEARS THE 4ØØ CHAR. LIMIT
*.
#ex 9Ø
WHEN THE CD HAS RECEIVED THE "SAVED" MESSAGE, TYPE IN "SAVED" AT THIS
TERMINAL AND HE WILL EXECUTE UNDER A SECOND CONDITION.
*.
#ex keywor
---KEYWORD--- IS THE FUNCTION THAT PERMITS EXTRANEOUS WORDS TO BE
INPUT, ALONG WITH THE "KEY WORDS" REQUIRED TO DEMONSTRATE KNOWLEDGE OF
THE TOPIC. THE PROGRAM IGNORES EVERYTHING IN THE RESPONSE EXCEPT THOSE
KEY------WHICH ARE SPECIFIED TO BE MATCHED.

*.

TYPE IN ANY RESPONSE THAT COMES TO MIND WHEN THIS SEQUENCE HAS BEEN
COMPLETED, AND WE WILL PROCEED.

*.
atc
OK ONE MORE EXAMPLE OF THE EX.

AS MENTIONED PREVIOUSLY, THE PURPOSE OF THE EX COMMAND IS TO PERMIT THE
CD TO EXECUTE HIS LESSON AND VERIFY THE LOGIC IF HE HAD JUST BEEN
CONSTRUCTING OR MODIFYING FRAMES AND WISHED TO EXECUTE THEM, HE WOULD
FIRST UPDATE THE SYSTEM TABLES ON DISK STORAGE VIA THE S--- COMMAND
*.
save
RIGHT
THE CD AT THE OTHER TERMINAL WILL INPUT A SAVE COMMAND, AS IF HE HAS
JUST FINISHED LESSON BUILDING, AND THEN WILL PROVE THAT HE CAN
IMMEDIATELY ENTER THE EX COMMAND FOR THE SAME LESSON. (TYPE IN "THRU"
AFTERWARDS.)
*.
thru
THIS CONCLUDES THE CDTS EX COMMAND. THE NEXT SYSTEM FUNCTION WE WILL
COVER IS THE EXECUTION MODE ITSELF. IF YOU WOULD RATHER BREAK FOR NOW
OTHERWISE TYPE "GO ON" AND WE'LL CONSIDER LESSON EXECUTION.
AND CONTINUE LATER, TYPE IN ?QUIT AND WE'LL PICK UP AT THIS POINT.
*.
go on
THE MAJOR FEATURES OF THIS MODE ARE
-TRAINEE CONTROL OVER THE PRESENTATION RATE OF COURSE MATERIAL,
SUBJECT TO THE CONSTRAINTS OF THE MCP, DCH, AND THE INTENT OF
THE COURSE DESIGNERS.

-SERVICE FUNCTIONS (PHONETIC COMPARISON, KEYWORD MATCH, AND/OR ORDER
PERMUTATION) TO PROVIDE LATITUDES IN EVALUATING TRAINEE ANSWERS THAT
DO NOT IDENTICALLY MATCH ANTICIPATED RESPONSES

-AUTOMATIC EVALUATION OF THE TRAINEE RESPONSES

-IMMEDIATE FEEDBACK, IF REQUIRED, TO THE TRAINEE AFTER HIS RESPONSE

-DETECTION OF ILLEGAL ACTIONS BY THE TRAINEE

-DYNAMIC SEQUENCING OF COURSE MATERIAL RESULTING FROM TRAINEE
RESPONSES AND COURSE DESIGNER INTENT

-LESSON CONTINUATION FROM THE APPROPRIATE POINT IF A LESSON IS
INTERRUPTED PRIOR TO COMPLETION

-CREATION OF TRAINEE PERFORMANCE RECORDS

```
#ex 378.5
LET'S SLOW DOWN A BIT AND CHECK ON BOTH OF THOSE DECISION STATEMENTS.
(TYPE OK WHEN YOU'RE READY FOR THE NEXT ONE)
*.
#ex 9Ø
WHEN THE CD HAS RECEIVED THE "SAVED" MESSAGE, TYPE IN "SAVED" AT THIS
TERMINAL AND HE WILL EXECUTE UNDER A SECOND CONDITION.
*.
#ex 6Ø3
HAVING DUPLICATE ANSWER TAGS--WHICH COULD INDICATE THAT THE COURSE
DESIGNER WISHES TO HAVE MORE THAN ONE ANSWER TREATED THE SAME BY THE
PROGRAM. FOR EXAMPLE, PLEASE INPUT THE NUMBER OF THE GROUP THAT IS USED
TO PRESENT TEXTUAL MATERIAL WITHIN A 'Q' FRAME----
*.
#save
SAVED
#ex 6Ø3
HAVING DUPLICATE ANSWER TAGS--WHICH COULD INDICATE THAT THE COURSE
DESIGNER WISHES TO HAVE MORE THAN ONE ANSWER TREATED THE SAME BY THE
PROGRAM. FOR EXAMPLE, PLEASE INPUT THE NUMBER OF THE GROUP THAT IS USED
TO PRESENT TEXTUAL MATERIAL WITHIN A 'Q' FRAME----
*.
#save done
SAVED
#ex 6Ø3
ILLEGAL FIRST COMMAND
```

End of Day 3 Formal Qualification Testing

Course Designer

THE LESSON EXECUTION FUNCTION STEPS SEQUENTIALLY FROM FRAME TO FRAME,
UNLESS A BRANCH IS ENCOUNTERED. THE FUNCTION REQUIRES THAT A GROUP 1
BEGIN EACH FRAME, BUT WILL HANDLE ANY LEGAL COMBINATION OF THE OTHER
----- TYPES OF GROUPS.
A TWO
B THREE
C FOUR
*.
b
CORRECT
GROUP 1 PROCESSING INVOLVES THE DETERMINATION OF FRAME TYPE AND THE
SETTING OF CONTROLS FOR THE PROCESSING OF SUBSEQUENT GROUPS.
THE FOLLOWING CONDITIONS WILL BE SET UP TO VERIFY THE PROPER PROCESSING
OF THE GROUP 1:
  1)AT LEAST THREE OCCURENCES OF EACH OF THE LEGAL FRAME TYPES,
    IN RANDOM ORDER.

  2)AT LEAST ONE LABELED FRAME FOR EACH FRAME TYPE.

  3)ONE OCCURRENCE OF A FRAME CONTAINING ONLY A GROUP ONE.

WITH THE EXCEPTION OF THE THIRD CONDITION, IT DOES NOT REALLY MAKE
SENSE TO ATTEMPT TO TEST THE FUNCTIONING OF THE GROUP 1 ALL BY ITSELF,
SO WE WILL VERIFY THE PROCESSING OF THE GROUPS 1 AND 2 TOGETHER.
IF YOU RECALL, THE GROUP TWO MERELY INVOLVES THE PRINTING OF TEXTUAL
MATERIAL FOR TWO FRAME TYPES---WHICH ARE:
A Q AND D
B Q AND M
C D AND M
*.
b
RIGHT - THE Q AND M FRAMES USE THE GROUP 2 TO PRINT TEXT

THE REACTIONS WE ARE ABOUT TO VERIFY ARE THAT:
  1)THE CONTENTS OF EACH GROUP 2 ARE PRINTED PROPERLY. THIS WILL BE
    VERIFIED BY EXAMINING THE LISTING OF THIS LESSON FOR FRAMES 359
    THROUGH 364.

  2)THE PROPER PRINTING OF SUCCESSIVE FRAMES CONTAINING ONLY GROUPS
    ONE AND TWO.

  3)THE FACT THAT THE GROUP 3 ANSWER CHOICES PRINT FOR M FRAMES, RATHER
    THAN THE OUTPUT STOPPING WITH THE GROUP 2.

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THIS IS ALSO A Q FRAME, HAVING 4ØØ CHARACTERS OF DATA (THE LIMIT FOR ANY FRAME.) THE PURPOSE OF THIS FRAME IS TO DEMONSTRATE THAT SUCCESSIVE FRAMES MAY CONTAIN JUST GROUPS 1 AND 2, AND THAT THE LENGTH OF THE GROUPS MAY VARY, UP TO A MAXIMUM LENGTH OF 4ØØ CHARACTERS OF DATA (INCL. CDTS CONTROL INFORMATION.)

THIS IS FRAME 363, WHICH IS AN M FRAME, AND IS LABELED "F363". THIS FRAME WILL CONTAIN ONLY THE GROUP TWO, AND WILL BE FOLLOWED BY ANOTHER M FRAME CONTAINING ONLY A GROUP TWO. THE TWO FRAMES WILL THEN BE FOLLOWED BY AN M FRAME CONTAINING A GROUP 3, BUT NO GROUP 2.

THIS IS FRAME 364, WHICH ALSO CONTAINS ONLY A GROUP 2. WHAT DO YOU SUPPOSE WE ARE TRYING TO PROVE BY SPLITTING THIS GROUP 2 FROM THE GROUP 3 WHICH IS ASSOCIATED WITH IT, BUT APPEARS IN THE NEXT FRAME?

A THAT ARBITRARY SPLITS OF GROUPS BETWEEN FRAMES CAN BE MADE
B THAT M FRAMES ARE EASY TO BUILD
C THAT YOU CAN STILL BUILD M FRAMES WHEN TEXT NEARS THE 4ØØ CHAR. LIMIT
*.
c
YES
BY LOOKING AT THE LISTING OF FRAMES 363-365 OF THIS LESSON YOU WILL SEE THAT THE TWO GROUP TWOS AND THE GROUP THREE ANSWER CHOICES WERE ALL PRESENTED AS IF THEY WERE CONTAINED WITHIN A SINGLE FRAME.

NOW LET'S CONSIDER THE GROUP TWO PROCESSING FOR THE OTHER TYPE OF FRAME WITHIN CDTS, WHICH IS THE "D", MEANING -------- FRAME.
*.
decision
GOOD
THE GROUP 2 WITHIN THE D FRAME CONTAINS ALL THE DATA FOR DECISION MAKING. THUS THERE ARE NO GROUP THREES OR FOURS ASSOCIATED WITH THE D FRAME. WITHIN THE GROUP THE CD CAN EVALUATE A SERIES OF TRAINEE RESPONSES; TEST ITEM VALUES SET IN PREVIOUS FRAMES; AND SPECIFY FEEDBACK AND BRANCHES BASED UPON WHETHER OR NOT THE CONDITIONS HE HAS SET UP ARE MET.

TO VERIFY THE D FRAME PROCESSING, YOU WILL BE PRESENTED WITH A SERIES OF FRAMES WHICH WILL INSTRUCT YOU AS TO WHAT ANSWERS ARE TO BE INSERTED. FOLLOWING THESE FRAMES WILL BE A SET OF DECISION FRAMES WHICH WILL DEMONSTRATE THE FUNCTIONING AND POWER OF THIS FRAME TYPE.

BY COMPARING YOUR RESPONSES WITH THE LESSON LISTING, YOU WILL BE ABLE TO VERIFY THE DECISION LOGIC. ALONG THE WAY WE WILL ALSO VALIDATE THAT ILLEGAL DECISION STATEMENTS ARE REJECTED AND ERRORS FLAGGED.

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```
 (FRAME 371 TYPE IN THE CORRECT ANSWER)
CDTS STANDS FOR COMPUTER DIRECTED -------- SUBSYSTEM
A TECHNICAL
B TRAINING
C TELEVISION
 *.
b
TRUE
(FRAME 372 TYPE IN THE CORRECT ANSWER)
THE INDIVIDUAL WHO CONSTRUCTS CDTS LESSONS IS TERMED A :
A COURSE DESIGNER
B CONSTRUCTION SUPERVISOR
*.
a
CORRECT
(FRAME 373 TYPE IN THE CORRECT ANSWER)
 CDTS IS DESIGNED TO BECOME AN INTEGRAL PART OF:
A THE CIVIL ENGINEERING SYSTEM
B THE BASE LEVEL SYSTEM
*.
b
FINE
(FRAME 374 TYPE IN THE INCORRECT ANSWER AND THEN FOLLOW IT WITH THE
CORRECT ANSWER)---WHAT MODE OF CDTS IS USED TO CONSTRUCT LESSONS?
A LESSON EXECUTION
B LESSON BUILDING
*.
a
WRONG,TRY AGAIN
*.
b
VERY GOOD (IF THIS IS YOUR SECOND RESPONSE)

(FRAME 375 TYPE IN ANY INCORRECT ANSWER)
 A CDTS LESSON REQUIRES --- THOUSAND BYTES OF DISK STORAGE?
*.
45
IT'S 121,ØØØ BYTES, BUT THAT'S OK.
THAT CONCLUDES OUR SEQUENCE FOR DECISION FRAME VERIFICATION. YOU SHOULD
HAVE A RECORD LIKE THIS:
  371     +
  372     +
   373     +
  374     -
   374     +
  375     -
```


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FRAME 377 WILL DETERMINE IF ALL THREE OF FRAMES 371-373 WERE
ANSWERED CORRECTLY.
GOOD, YOU GOT THEM ALL.
FRAME 378 WILL EXERCISE THE "WRONG" TEST, SINCE YOU SHOULD HAVE
MISSED BOTH FRAMES 374 AND 375.
SOMEHOW YOU GOT EITHER 374 OR 375 RIGHT.
LET'S SLOW DOWN A BIT AND CHECK ON BOTH OF THOSE DECISION STATEMENTS.
(TYPE OK WHEN YOU'RE READY FOR THE NEXT ONE)
*.
ok
OK, NOW FOR TWO MORE DECISIONS.
FRAME 379 WILL DETERMINE IF THE LAST RESPONSE TO FRAMES 371-374 WERE
CORRECT (SINCE YOU SHOULD HAVE GOTTEN 374 RIGHT ON THE SECOND TRY).
GOOD, YOU DID IT AGAIN.
FRAME 380 WILL TEST THE "ALL RIGHT" CAPABILITY (WHICH YOU DIDN'T DO).
OK, YOU DIDN'T GET THEM ALL RIGHT.
AFTER YOU HAVE EXAMINED THE PROCESSING OF "LAST RIGHT" AND "ALL RIGHT",
WE'LL TRY OTHER VARIATIONS. AS YOU CAN SEE, FRAME 374 QUALIFIES FOR
"LAST RIGHT" SINCE THE LAST RESPONSE WAS CORRECT, BUT IT DOES NOT
QUALIFY FOR "ALL RIGHT", WHICH PERMITS NO WRONG ANSWERS AT ALL.
TYPE OK WHEN OK

*.
ok
FRAME 381 WILL DEMONSTRATE THE COMPOUND STATEMENT, LOOKING FOR RIGHT
ANSWERS TO FRAMES 371-372 AND A WRONG ANSWER TO FRAME 375.
YOU GOT THE RIGHT TWO.
FRAME 382 WILL TEST THE COMPOUND STATEMENT INVOLVING AN "OR" CON-
DITION, LOOKING FOR 1 OR MORE RIGHT OR LESS THAN 3 WRONG.
IMPOSSIBLE
NOW LET'S EXAMINE THE CAPABILITY OF DETERMINING IF THE STUDENT INSERTED
SPECIFIC ANSWER TAGS. IF INSTRUCTIONS WERE FOLLOWED FOR FRAMES 371-374,
YOU INSERTED "B" FOR 371, "A" FOR 372, "B" FOR 373 AND "A" FOR 374.
FRAME 384 WILL BE A COMPOUND DECISION STATEMENT, LOOKING FOR THESE
VALUES.

YOU DIDN'T FOLLOW INSTRUCTIONS. WE STILL HAVE VERIFIED
THIS TYPE OF PROCESSING, HOWEVER, SINCE YOU DIDN'T BRANCH TO 384.5
EXCELLENT. YOU ANSWERED PROPERLY, AND WERE THEREFORE BRANCHED TO
THIS FRAME (384.5)

THE LAST TYPE OF DECISION FRAME PROCESSING TO BE VERIFIED IS THE AREA
OF SETTING AND EVALUATING ITEMS. TO DEMONSTRATE THIS WE WILL GO THROUGH
THREE SIMPLE DECISION STATEMENTS, EACH OF WHICH SETS AN ITEM. THE
FOURTH DECISION IN THE SEQUENCE WILL LOOK FOR ANY TWO OF THE THREE
TO BE SET.

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IF YOU WISH TO PAUSE AT THIS POINT SO YOU CAN REVIEW THE VARIOUS PATHS THROUGH THE PREVIOUS DECISION STATEMENTS, TYPE HALT. IF YOU WISH TO GO ON TYPE CONTINUE.
*.
continue
HERE WE GO.
ITEM1 IS NOW SET TO 1.
ITEM2 IS NOW SET TO 1.
ITEM3 IS NOW SET TO 1.

WE WILL NOW TEST FOR VALUES OF 1 FOR ANY COMBINATION OF ITEMS 1, 2, AND 3.

SINCE THE BRANCH TO THIS FRAME (389) WAS TAKEN, YOU MUST HAVE PROPERLY EXECUTED THE FRAMES IN QUESTION.

WE HAVE EXAMINED MANY OF THE ASPECTS OF USING DECISION FRAMES IN A LEGAL MANNER. THERE ARE MANY WAYS OF FORMATTING DECISION STATEMENTS WHICH DO NOT ENTIRELY CONFORM TO SYSTEM RESTRICTIONS, BUT CONTAIN ERRORS WHICH CANNOT BE DETECTED BY THE LESSON BUILDING FUNCTION.

THE NEXT THREE FRAMES CONTAIN ERRORS IN FORMAT, AND WILL RESULT IN THE OUTPUT OF THE MESSAGE "ILLEGAL DECISION STATEMENT
CONTINUE? YES/NO"- YOU ARE TO ANSWER YES, OF COURSE, SO THAT THE TEST MAY CONTINUE. (IN AN OPERATIONAL ENVIRONMENT THE STUDENT WOULD BE INSTRUCTED TO CONTACT HIS TRAINING SUPERVISOR BEFORE CONTINUING. THIS FIRST EXAMPLE WILL BEGIN THE LINE WITH A PROPER DECISION STATEMENT, BUT WILL BE FOLLOWED BY AN "ELSE" CONDITION WITHOUT SPECIFYING THE ACTION TO BE TAKEN FOR THE FIRST CONDITION.

THIS NEXT EXAMPLE OF AN ILLEGAL DECISION FRAME WILL INVOLVE A BRANCH THAT DOES NOT CONFORM TO SYSTEM RESTRICTIONS HERE THE BRANCH WILL BE ATTEMPTED TO A NONEXISTANT FRAME NUMBER, RESULTING IN THE OUTPUT OF THE MESSAGE "ILLEGAL BRANCH - CONTINUE? YES NO"

(THE EXACT FORMAT OF THE FRAME IS: 'IF LAST RIGHT 35Ø B 9.99.9')

ANOTHER AREA IN WHICH THE COURSE DESIGNER CAN GET IN TROUBLE IS WITH THE FORMAT OF ITEM STATEMENTS, WHICH CAN BE BOTH SET UP AND TESTED WITH THE D FRAME. WE SHALL ATTEMPT TO DEMONSTRATE FOUR EXAMPLES OF ILLEGAL ITEM STATEMENTS WITHIN DECISION FRAMES, CONSTRUCTED THUSLY:

IF ITEM5Ø EQ 5 B:1ØØ (ILLEGAL ITEM NAME)
IF ITEM1 EQ 1 %: ITEM1=1ØØØ (ILLEGAL ITEM VALUE)
IF ITEM1Ø EQ ITEM2Ø F:GOOD (ITEM2Ø IS AN ILLEGAL VALUE FOR AN ITEM)
%: ITEM1= ITEM+1 (ILLEGAL ITEM NAME)
TYPE YES TO CONTINUE AFTER EACH MESSAGE

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```
ILLEGAL ITEM NAME   394.Ø 2        1.Ø
CONTINUE? TYPE YES/NO.
yes
ILLEGAL DECISION STATEMENT  394.2 2        1.Ø
   CONTINUE? TYPE YES/NO.
yes
ILLEGAL ITEM NAME   394.3 2        1.Ø
CONTINUE? TYPE YES/NO.
yes
THE LAST EXAMPLE OF IMPROPER USE OF DECISION FRAMES INVOLVES "DECISION
FRAME INDICATORS. EACH FRAME THE CD WANTS TO USE WITHIN A DECISION
FRAME MUST HAVE A FLAG "1" INPUT IMMEDIATELY FOLLOWING THE FRAME TYPE
IN THE GROUP 1. IF A FRAME IS NOT FLAGGED, THE TRAINEE RESPONSES
WILL NOT BE SAVED FOR LATER EXAMINATION BY THE D FRAME. TO ILLUSTRATE
THIS, WE WILL ATTEMPT TO MAKE A DECISION BASED SOLELY UPON YOUR
RESPONSE TO THIS FRAME, WHICH HAS NOT BEEN FLAGGED. (ANSWER "A")
A IT WILL WORK
 B IT WONT WORK
*.
b
OK, THIS D FRAME WILL FEEDBACK "VERY GOOD, YOU FOLLOWED INSTRUCTIONS"
IF IT DETERMINES THAT THE PREVIOUS FRAME RECEIVED AN "A" ANSWER.
SORRY, FRAME 395 WAS NOT FLAGGED.
NOW FOR FURTHER PROOF WE WILL DUPLICATE THIS TEST FOLLOWING THIS FRAME,
WHICH AS YOU CAN SEE BY THE LISTING, HAS BEEN FLAGGED  (ANSWER "A")
A IT WILL WORK
 B IT WON'T WORK.
*.
a
THIS TIME YOU SHOULD GET THE "VERY GOOD" FEEDBACK.
VERY GOOD. YOU FOLLOWED INSTRUCTIONS

THIS CONCLUDES THE DEMONSTRATION OF DECISION FRAME PROCESSING, WHICH
LEADS TO CONSIDERATION OF THE GROUPS 3 AND 4 FOR THE Q AND M FRAMES.
IF NOW SEEMS TO BE A GOOD TIME TO BREAK, TYPE ?QUIT AND WE WILL DO SO.
OTHERWISE TYPE IN CONTINUE.


*.
continue
```


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GROUP 3 - Q FRAME

THE GROUP 3 PROCESSING FOR THE Q FRAME INVOLVES THE EVALUATION OF EACH RESPONSE INSERTED BY THE TRAINEE, AND AN ATTEMPT TO MATCH THE RESPONSE WITH SPECIFIED CORRECT AND INCORRECT ANSWERS.

DURING THE EVALUATION OF THE GROUP 3 WE WILL WORK WITH SEVERAL COMBINATIONS OF THE SERVICE FUNCTIONS KEYWORD, ORDER, AND PHONETIC BEING ON AND OFF, DUPLICATE ANSWER TAGS, NO CORRECT ANSWERS SPECIFIED, SPLIT FRAMES, AND VARIATIONS OF INSERTED ANSWERS.

SINCE THE GROUP 4 PROCESSING IS TO BE VERIFIED AT A LATER TIME, THE GROUP FOURS FOR THESE FRAMES WILL BE AS SIMPLE AS POSSIBLE, AND NORMALLY WILL JUST BE USED TO GIVE FEEDBACK THAT THE PROPER ANSWER MATCH HAS OCCURRED. THE FIRST DEMONSTRATION WILL INVOLVE A FRAME HAVING DUPLICATE ANSWER TAGS--WHICH COULD INDICATE THAT THE COURSE DESIGNER WISHES TO HAVE MORE THAN ONE ANSWER TREATED THE SAME BY THE PROGRAM. FOR EXAMPLE, PLEASE INPUT THE NUMBER OF THE GROUP THAT IS USED TO PRESENT TEXTUAL MATERIAL WITHIN A 'Q' FRAME----
*.
two
RIGHT---TWO OR 2

FROM THE LESSON LISTING YOU CAN SEE THAT BOTH TWO AND 2 WERE GIVEN AN 'A' ANSWER TAG AND ARE CONSIDERED TO BE EXACTLY THE SAME

NEXT WE WILL SEE FRAMES WITH DIFFERENT NUMBERS OF ANSWERS TAGGED AS BEING CORRECT, TO PROVE THAT CDTS WILL HANDLE VARYING COMBINATIONS OF RIGHT AND WRONG ANSWERS. THIS FRAME (6Ø5) HAS NO CORRECT ANSWERS.

WHAT IS THE EXACT CORE STORAGE REQUIRED BY CDTS?
*.
who knows
NO
THE NEXT FRAME (6Ø7) CONTAINS WHAT MIGHT BE CONSIDERED AS A "NORMAL" MIX OF ANSWERS TAGGED AS BEING CORRECT AND INCORRECT, AND LOOKS LIKE:
A+PLUS
A++
B DOLLAR SIGN
B $
C (
D BLANK

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WHAT CHARACTER IS USED BY CDTS TO FLAG CORRECT ANSWERS WITHIN THE GROUP THREE?
*.
plus
TRUE
IF YOU WILL RECALL, IT WAS BROUGHT OUT DURING THE DISCUSSION OF GROUP TWO PROCESSING THAT THE GROUPS 1, 3, AND 4 THAT ARE ASSOCIATED TOGETHER MAY BE SPLIT BETWEEN FRAMES, IF REQUIRED BY THE AMOUNT OF DATA.

LET'S DEMONSTRATE AGAIN THAT THE PROGRAM WILL AUTOMATICALLY MOVE TO THE NEXT NUMBERED FRAME IN SEARCH OF A GROUP THREE. IT WILL CONTINUE TO PRINT TEXT UNTIL A GROUP 3 IS FINALLY ENCOUNTERED, AT WHICH TIME SOME KIND OF ANSWER MUST BE INSERTED TO CONTINUE.

THIS FRAME WILL BE FOLLOWED BY FRAME 609, WHICH HAS THE GROUPS 3 AND 4.
(TYPE IN "I UNDERSTAND")
*.

i understand
GOOD, THIS IS AN IMPORTANT CONCEPT.

KEYWORD, PHONETIC AND ORDER

WHEN DISCUSSING THE CONSTRUCTION OF THE GROUP 3 DURING THE LESSON BUILDING SECTION OF THE DEMONSTRATION, WE VERY BRIEFLY MENTIONED THE CDTS SERVICE FUNCTIONS OF KEYWORD, PHONETIC AND ORDER.

THESE FUNCTIONS MAY BE SET ON OR OFF, AT COURSE DESIGNER OPTION, TO DIRECT THE PROGRAM TO ACCEPT RESPONSES BY THE STUDENT WHICH ARE LESS THAN "PERFECT". THE STUDENT MAY RECEIVE CREDIT FOR PROPERLY ANSWERING A QUESTION WHEN HE UNDERSTANDS THE CONCEPTS, BUT:

1)PUTS IN A SEQUENCE OF CORRECT ANSWERS, BUT NOT IN ORDER

2)INPUTS THE CORRECT ANSWER, BUT ADDS AN EXTRA WORD OR WORDS

3)DOESN'T SPELL OR TYPE TOO WELL

4)HAS ALL OF THE ABOVE PROBLEMS

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IN ADDITION, VARIOUS COMBINATIONS OF THE FUNCTIONS BEING SET ON CAN RELIEVE THE CD OF THE RESPONSIBILITY (AND TIME CONSUMING PROCESS) OF DETERMINING AND INPUTTING EVERY REASONABLY CORRECT ------ TO A QUESTION
*.
answer
OK
---KEYWORD--- IS THE FUNCTION THAT PERMITS EXTRANEOUS WORDS TO BE INPUT, ALONG WITH THE "KEY WORDS" REQUIRED TO DEMONSTRATE KNOWLEDGE OF THE TOPIC. THE PROGRAM IGNORES EVERYTHING IN THE RESPONSE EXCEPT THOSE KEY------WHICH ARE SPECIFIED TO BE MATCHED.

*.
words
TRUE
THE PROGRAM WILL, OF COURSE, USE THE KEYWORD TECHNIQUE TO EVALUATE ALL ANSWERS WITHIN THE FRAME, WHETHER TAGGED AS CORRECT ANSWERS OR NOT. THE CD MUST HAVE BEEN CAREFUL IN USING KEYWORD. IF HE HAS SPECIFIED AN INCORRECT ANSWER WHICH HAS KEYWORDS THAT ALSO APPEAR IN THE CORRECT ANSWER THE ORDER OF THE ANSWERS IS CRITICAL.

FOR EXAMPLE:
THE NEXT FRAME (617) WILL CONTAIN THE FOLLOWING GROUP 3:

Ø KEYWORD ON
A+COMPUTER DIRECTED TRAINING SUBSYSTEM
B COMPUTER TRAINING

TYPE IN SOMETHING LIKE "I THINK IT IS COMPUTER DIRECTED TRAINING SUB-SYSTEM"

WHAT DOES CDTS STAND FOR?
*.
probably stands for computer subsystem straing training
NOT QUITE - COMPUTER------- TRAINING ---------?

*.
directed subsystem
NOW THE NEXT FRAME (619) WILL REVERSE THE ORDER OF THE TWO SPECIFIED ANSWERS. TYPE IN THE CORRECT ANSWER EXACTLY RIGHT AND YOU WILL SEE THAT THE INCORRECT ANSWER IS MATCHED. THIS IS BECAUSE THE PROGRAM QUITS THE ANSWER MATCHING PROCESS AS SOON AS THE TRAINEE ANSWER IS MATCHED WITH THE KEYWORDS WITHIN A LESSON ANSWER.

WHAT DOES CDTS STAND FOR?
*.
computer directed training subsystem

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NOT QUITE - YOU OMITTED THE POINT THAT IT COMPUTER 'DIRECTED'.

NOW LET'S CONSIDER ---ORDER---

ORDER IS THE FUNCTION THAT PERMITS THE TRAINEE RESPONSES TO BE COUNTED AS CORRECT WHEN THE SEQUENCE OF WORDS IS UNIMPORTANT. THE PROGRAM WILL TAKE EACH WORD OF A TRAINEE ANSWER AND SEARCH THE FIRST LESSON ANSWER FOR IT. THIS PROCESS REPEATS UNTIL EACH WORD WITHIN 2638 85 TRAINEE AND LESSON ANSWER HAS BEEN EXAMINED. IF THERE IS A ONE-FOR-ONE MATCH, REGARDLESS OF ORDER, THE LESSON ANSWER IS CONSIDERED MATCHED. IF NOT THE NEXT LESSON ANSWER IS EXAMINED IN THE SAME MANNER.

AS WITH THE KEYWORD FUNCTION, EACH LESSON ANSWER IS EVALUATED IN THE SAME MANNER, WHETHER TAGGED AS RIGHT OR WRONG.

TO SUMMARIZE 'ORDER' PROCESSING - EACH WORD WITHIN AN INSERTED RESPONSE MUST MATCH EACH WORD OF A LESSON ANSWER, INDEPENDENT OF THE ORDER OF WORDS WITHIN:
A THE LESSON ANSWER
B THE TRAINEE ANSWER
C EITHER ANSWER
*.
c
THE CORRECT ANSWER IS EITHER ANSWER
OK, LET'T SEE SOME EXAMPLES OF ORDER

HERE'S A SIMPLE ONE. NAME THE TWO SERVICE FUNCTIONS WE HAVE CONSIDERED SO FAR. (INPUT THEM BOTH ON ONE LINE WITH ONE SPACE BETWEEN EACH NAME)
*.
keyword order
GOOD, KEYWORD ORDER, OR ORDER KEYWORD.
IF YOU HAPPENED TO INPUT THE SEQUENCE, 'KEYWORD ORDER', YOU SPECIFIED THE SAME SEQUENCE THAT IS IN THE FRAME, AND DIDN'T REALLY DEMONSTRATE THE FUNCTIONING OF ORDER. IF THIS THE CASE, TYPE 'YES' AND WE'LL TRY IT AGAIN THE OTHER WAY (ORDER KEYWORD)OTHERWISE TYPE "PROVEN"

*.
yes
HERE'S A SIMPLE ONE. NAME THE TWO SERVICE FUNCTIONS WE HAVE CONSIDERED SO FAR. (INPUT THEM BOTH ON ONE LINE WITH ONE SPACE BETWEEN EACH NAME)
*.
order keyworshd
GOOD, KEYWORD ORDER, OR ORDER KEYWORD.

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KEYWORD AND ORDER ON
****

NOW TO CONSIDER THE POWER OF HAVING BOTH OF THE KEYWORD AND ORDER FUNCTIONS ON.

THE LOGIC OF BOTH FUNCTIONS OPERATING TOGETHER IS REALLY QUITE SIMPLE. TO BE MATCHED BY A TRAINEE RESPONSE, EACH KEYWORD WITHIN A LESSON ANSWER MUST APPEAR IN HIS RESPONSE, BUT INDEPENDENT OF ANY ORDER. IN ADDITION, THE TRAINEE RESPONSE MAY CONTAIN EXTRANEOUS WORDS, WHICH WILL BE IGNORED BY THE MATCHING PROCESS.

FOR EXAMPLE, TYPE IN THE NAME OF THE THREE SERVICE FUNCTIONS, KEYWORD, ORDER, AND PHONETIC, ALL ON ONE LINE, WITH ONE BLANK BETWEEN EACH NAME. USE THE WORDS FUNCTION, SERVICE FUNCTION, OR ANY OTHER EXTRA WORDS IN YOUR ANSWER.

*.
keyword on order on function set phonetic
CHECK

THE PHONETIC ENCODING PROCESS
****

THE PHONETIC SERVICE FUNCTION PERMITS THE STUDENT TO RECEIVE CREDIT FOR ANSWERS, EVEN WHEN SLIGHTLY MISPELLED. THE PROGRAM ENCODES BOTH THE INSERTED ANSWER AND EACH LESSON ANSWER, PRIOR TO ATTEMPTING TO MATCH THEM. THE PHONETIC ENCODING PROCESS IS ACCOMPLISHED IN FOUR STEPS, AS FOLLOWS:

STEP 1 - LETTER EQUIVALENT

ALL LETTERS ARE TRANSFORMED INTO THEIR LETTER EQUIVALENTS:
ORIGINAL LETTER--- ABCDEFGHIJKLMNOPQRSTUVWXYZ
LETTER EQUIVALENT- ABCDABCHACCLMMABCRCDABHCAC

STEP 2 - THE H REPLACEMENT

EACH H IN THE WORD IS TRANSFORMED TO THE PRECEDING LETTER UNLESS THE H IS THE FIRST LETTER.

STEP 3 - ELIMINATION OF SUCCESSIVE IDENTICAL CONSONANTS

ALL BUT THE FIRST LETTER OF AN UNINTERRUPTED SEQUENCE OF CONSONANTS ARE ELIMINATED.

STEP 4 - ELIMINATION OF ALL A'S

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ALL VOWELS, TRANSFORMED INTO A'S ARE ELIMINATED AND THE FINAL WORD CONTAINS ONLY CONSONANTS.

AS A MATTER OF NECESSITY, THE PROGRAM PHONETICALLY ENCODES THE TRAINEE RESPONSE FIRST, SAVES BOTH THE ORIGINAL AND ENCODED FORMS OF HIS RESPONSE, AND THEN BEGINS ENCODING OF THE LESSON ANSWERS. THE REASON THE ORIGINAL FORM OF THE TRAINEE RESPONSE IS SAVED IS:
A HIS ANSWER MAY MATCH WITHOUT THE NEED FOR PHONETIC ENCODING
B THE CD CAN TURN PHONETIC OFF LATER IN THE FRAME
*.
a
THIS MAY BE TRUE, BUT IS REALLY A VERY MINOR POINT.

AS A MATER OF EFFICIENCY, THERE IS ALSO ANOTHER OPTION WITHIN THE ENCODING PROCESS - THE PROGRAM COULD ENCODE EVERY LESSON ANSWER BEFORE ATTEMPTING TO MATCH THE TRAINEE ANSWER, OR COULD ENCODE LESSON ANSWERS ONE AT A TIME, ATTEMPTING TO MATCH THE FIRST BEFORE ENCODING THE SECOND.

WHICH TECHNIQUE WOULD YOU THINK THE PROGRAM SHOULD USE?
A ENCODE EACH ANSWER JUST BEFORE ATTEMPTING THE MATCH
B ENCODE ALL ANSWERS FIRST
*.
a
RIGHT - ONE AT A TIME

AS YOU MIGHT EXPECT, THE PHONETIC FUNCTION CAN BE USED IN CONJUNCTION WITH EITHER KEYWORD, ORDER OR BOTH. LET'S LOOK AT A COUPLE OF EXAMPLES OF THE USE OF PHONETIC ALONG WITH ORDER.

FRAME 637 WILL HAVE PHONETIC AND ORDER ON, WITH A CORRECT ANSWER OF 'PHONETIC ORDER.'
TO VERIFY THE COMBINED OPERATION OF THESE FUNCTIONS, TYPE IN THE WORDS MISPELLED, AND IN THE WRONG ORDER -'ORDOR PHOMETIC'
*.
arder phenetical
YOU MUST HAVE MISPELLED IT TOO BADLY. TRY AGAIN.
*.
orderhs phenitic
YOU MUST HAVE MISPELLED IT TOO BADLY. TRY AGAIN.
*.
ordor phenetic
GOOD - YOUR MISPELLED, OUT OF ORDER ANSWER WAS ACCEPTED.
NOW FOR THIS EXAMPLE, WE WILL SEE WHAT HAPPENS WHEN PHONETIC AND

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ORDER ARE TURNED ON IN THE MIDDLE OF THE GROUP 3. FRAME 64Ø WILL BE CONSTRUCTED LIKE THIS. (WITHIN THE GROUP 3):

Ø ORDER OFF
Ø PHONETIC OFF
A+VERY GOOD
1 ORDER ON

1 PHONETIC ON
B+VERY GOOD

THIS MEANS THE PROGRAM WILL ATTEMPT TO FIRST MATCH 'VERY GOOD' WITH THESE FUNCTIONS OFF. SINCE WE WILL HAVE YOU INSERT AN ANSWER THAT IS OUT OF ORDER AND MISPELLED, IT WON'T MATCH. YOUR ANSWER WILL MATCH 'B' HOWEVER, SINCE THE FUNCTIONS ARE TURNED ON AT THAT POINT. OK, NOW TYPE IN 'GOOD VARY'

*.
good vary
YOU ARE CLOSE, BUT YOUR SPELLING AND ORDER ARE OFF. TRY AGAIN, WITH
*.
very good
GOOD. YOUR SPELLING AND ORDER ARE CORRECT.

AS YOU CAN SEE, YOUR FIRST ANSWER REQUIRED THE FUNCTIONS TO BE ON, AND MATCHED 'B'. YOUR SECOND ANSWER SHOULD HAVE MATCHED 'A', SINCE IT DID NOT REQUIRE ORDER OR PHONETIC FOR A MATCH.

SO MUCH FOR PHONETIC AND ORDER NOW LET'S TRY PHONETIC AND KEYWORD. THIS MEANS THAT YOU CAN MISPELL AND HAVE EXTRANEOUS WORDS IN YOUR ANSWERS, BUT YOU MUST INPUT WITHIN THE SPECIFIED SEQUENCE. FRAME 644 HAS A GROUP 3 THAT LOOKS LIKE THIS:

Ø PHONETIC ON
Ø KEYWORD ON
A+COMPUTER DIRECTED

THE QUESTION IS 'CDTS STANDS FOR WHAT?' WE HAVE DECIDED THAT THE WORDS 'COMPUTER DIRECTED' WILL SUFFICE FOR A CORRECT ANSWER, AND THAT WE DO NOT CARE IF YOU SPELL THEM PROPERLY.

FIRST TYPE IN 'DIRECTED COMPUTER'. IT WILL BE REJECTED SINCE THE ORDER IS BAD. THEN TYPE IN 'CONPUTER DORECTED TRAINING'.

*.
directed computer
NO, THAT'S NOT IT, TRY AGAIN.
*.

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conputer dorected training
RIGHT - COMPUTER DIRECTED TRAINING SUBSYSTEM.
SINCE YOU MATCHED 'COMPUTER DIRECTED', YOUR ANSWER WAS SUCCESSFULLY
PHONETICALLY ENCODED, AND THE WORD 'TRAINING' WAS IGNORED BY KEYWORD.

NOW FOR THE FINAL TEST, WE WILL TURN ALL THREE FUNCTIONS ON TOGETHER.
FRAME 646 WILL EXPECT AN ANSWER OF 'PHONETIC KEYWORD ORDER'. INSERT
THIS ANSWER IN ANY ORDER, WITH KEYWORD SPELLED AS 'KOIWARD',
AND WITH EXTRA WORDS, SUCH AS 'IT MIGHT BE'
*.
i think it is phonetic koiward and the other is order
HEY IT WORKS.

IF YOU WOULD LIKE TRY THAT INPUT AGAIN, WITH OTHER EXTRANEOUS WORDS,
OR WITH A DIFFERENT ORDER, JUST TYPE IN ?GOTO ALLON. OTHERWISE TYPE
GO AND WE WILL WRAP UP THIS TOPIC.

*.
go
OK, NOW FOR THE M FRAME GROUP 3
GROUP 3 - M FRAME
****

AS DISCUSSED DURING THE LESSON BUILDING DEMONSTRATION, THE GROUP 3
WITHIN THE M FRAME INVOLVES THE PRINTING OF ANSWER CHOICES AT THE
TERMINAL, AND MATCHING OF THE ANSWER TAG INSERTED BY THE TRAINEE WITH
THE CHOICES AFFORDED HIM.

THE SERVICE FUNCTIONS, PHONETIC, KEYWORD AND ORDER HAVE NO MEANING
IN THE M FRAME, SINCE THE STUDENT IS EXPECTED TO INPUT A SINGLE LETTER.
IF THE COURSE DESIGNER INADVERTANTLY ATTEMPTS TO TURN ANY OF THESE
FUNCTIONS ON, THEY WILL BE IGNORED.

WITH THIS EXCEPTION, THE FUNCTIONING OF THE M FRAME GROUP 3 IS
ESSENTIALLY THE SAME AS WITH THE Q FRAME. LET'S EXAMINE THE PROGRAM'S
PROCESSING OF DUPLICATE ANSWER TAGS, AND FRAMES CONTAINING A RANGE
GOING FROM NO CORRECT ANSWERS TO ALL CORRECT ANSWERS.

FRAME 651 PRESENTS TWO ANSWER CHOICES, BUT NEITHER IS TAGGED AS BEING
CORRECT. (TYPE IN A SINGLE LETTER)
A THIS ANSWER IS CORRECT
B THIS ANSWER IS CORRECT
*.
b
WRONG, NEITHER ANSWER HAS BEEN TAGGED AS BEING CORRECT.

Page 305 blank

NOW LET'S LOOK AT A FRAME WITH ALL CORRECT ANSWERS.

A THIS ANSWER IS CORRECT
B THIS ANSWER IS CORRECT
*.
ab
CHOOSE ONE OF THE ABOVE LETERS
*.
b
CHECK
NOW LET'S SEE HOW M FRAMES MAY BE SPLIT BETWEEN GROUPS. YOU WILL NOTICE THAT WHEN THE M FRAME IS SPLIT AND THE STUDENT IS INSTRUCTED TO TRY AGAIN, THE ANSWER CHOICES ARE PRINTED AGAIN. (WHICH DOESN'T HAPPEN WHEN A SINGLE M FRAME CONTAINS ALL FOUR GROUPS). THIS HAPPENS BECAUSE THE PROGRAM HAS TO BACK UP AND RETRIEVE THE GROUP 3 FOR:
A A SECOND ATTEMPT AT MATCHING (THIS IS CORRECT, BUT DON'T SELECT IT)
B THE PROGRAM IS CONFUSED (SELECT THIS ONE FIRST)
C THERE IS NO REAL REASON (SELECT THIS ONE SECOND)
*.
b
WRONG,TRY AGAIN
A A SECOND ATTEMPT AT MATCHING (THIS IS CORRECT, BUT DON'T SELECT IT)
B THE PROGRAM IS CONFUSED (SELECT THIS ONE FIRST)
C THERE IS NO REAL REASON (SELECT THIS ONE SECOND)
*.
cc
WRONG AGAIN, BUT YOU WERE TOLD TO DO THIS.

NOW LET'S SEE WHAT HAPPENS WHEN YOU ATTEMPT TO INPUT SOMETHING OTHER THAN ONE OF THE ANSWER CHOICES PRESENTED TO YOU. (TYPE IN ANYTHING BUT A OR B THE FIRST TIME. YOU WILL BE INSTRUCTED TO 'CHOOSE ONE OF THE ABOVE LETTERS).

A THIS IS RIGHT ANSWER
B THIS IS WRONG ANSWER
*.
d
CHOOSE ONE OF THE ABOVE LETTERS
*.
a
RIGHT, THAT WAS THE RIGHT ANSWER
THIS CONCLUDES THE DEMONSTRATION OF GROUP 3 PROCESSING. THE GROUP 4 FOR D AND M FRAMES (USED FOR SETTING OF ITEMS FOR USE WITHIN DECISION FRAMES; PRINTING OF THE CORRECT ANSWER; AND BRANCHING TO ANOTHER FRAME OR CUES TO RESPOND AGAIN TO THE SAME FRAME) HAS ALREADY BEEN DEMONSTRATED IN DETAIL WHEN WE VERIFIED THE PROCESSING OF THE GROUP 3. RATHER THAN REPEATING A TEST OF THE GROUP 4, WE WILL GO BACK AND COMPARE THE PRINTOUTS OF YOUR PATH THROUGH THIS LESSON WITH THE LISTING OF THE LESSON THAT WAS PRODUCED BY OFF-LINE LESSON BUILDING.

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THE PROCESSING WE WILL VERIFY IS SPECIFIED ON PAGES 42-44 OF
THE TEST PLAN. IF YOU WOULD RATHER DO THIS AT A LATER TIME, TYPE IN
GO ON, AND WE SHALL MOVE DIRECTLY TO A DEMONSTRATION OF THE TRAINEE
RECORD PROCESSING FUNCTION.

.
go on
OK

UNCLASSIFIED

PREPARED 69 JUNE 16 INDIVIDUAL HISTORY

LESSON-NAME DEMO OPTION	FRAME	TRAINEE NAME TYPE	AF-STUDENT ANSWER	TR-ID 123456789 RIGHT/WRONG
	ØØ1.Ø	M	A	+
	Ø31.Ø	Q		
	Ø32.Ø	M	B	-
	Ø32.Ø	M	C	+
	Ø33.Ø	Q	A	+
	Ø33.5	D		
	Ø52.Ø	Q	C	-
	Ø52.Ø	Q	-	-
	Ø52.Ø	Q	B	+
GOTO	Ø53.Ø	Q		
	Ø69.Ø	M	B	+
	Ø7Ø.Ø	M	C	+
	Ø7Ø.5	D		
	Ø7/.Ø	Q	A	+
	Ø78.3	M	D	-
	Ø78.3	M	B	+
	Ø78.7	D		
	Ø65.5	M	A	+
	Ø66.Ø	Q	C	+
	Ø79.Ø	M	B	+
DONE	Ø8Ø.Ø			

TOTAL NUMBER OF RIGHT RESPONSES Ø11
TOTAL NUMBER OF WRONG ØØ4
TOTAL NUMBER OF UNANTICIPATED RESPONSES ØØ1
TOTAL NUMBER OF RESPONSES Ø15

UNCLASSIFIED

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IN THE ABOVE SEQUENCE, THE AF-STUDENT WITH THE TR-ID OF 123456789 ENTERED LESSON DEMO AT FRAME 1.ØØ WHICH WAS A MULTIPLE-CHOICE FRAME. ENTERING THE ANSWER 'A' HE WAS BRANCHED BY THE PROGRAM TO FRAME 31.ØØ WHERE TEXTUAL MATERIAL WAS PRESENTED FOR WHICH A STUDENT RESPONSE WAS NOT REQUIRED.

THIS IS INDICATED BY THE ABSENCE OF ANY DATA IN THE ANSWER AND RIGHT/WRONG COLUMNS.

THE STUDENT PROCEEDS WITHIN THE LESSON (MISSING FRAME 32.Øø THE FIRST TIME) UNTIL HE ENTERS THE DECISION FRAME 33.5Ø.
THE RIGHT ANSWER FOR FRAME 32.ØØ AS INDICATED IN THE TRAINEE RECORD PRINTOUT IS:

```
 A D
B C
C B
D A
*.
c
```

NO, THAT IS A WRONG ANSWER. LOOK AT THE TRAINEE RECORD AND TRY AGAIN.

```
*.
b
```

VERY GOOD.
WITHIN THE DECISION FRAME, THE STUDENT MEETS A PARTICULAR CONDITION AS ESTABLISHED BY THE COURSE DESIGNER AND IS BRANCHED TO FRAME 52.ØØ.

HAVING TROUBLE WITH THIS FRAME, AS INDICATED BY THREE REPETITIONS, THE STUDENT USES THE GOTO OPTION AT FRAME 53.ØØ TO BRANCH TO A FRAME LABEL CONTAINED WITHIN FRAME 69.ØØ.

THE STUDENT CONTINUES WITHIN THE LESSON UNTIL FRAME 78.7Ø. AT THIS POINT HE IS BRANCHED BACK TO FRAMES 65.5Ø AND 66.ØØ FOR A BRIEF REVIEW. HAVING SUCCESSFULLY 'PASSED' THESE TWO ITEMS, THE STUDENT IS BROUGHT BACK TO THE MAIN PATH OF THE LESSON.

```
FRAME 78.3 IS A
A Q
B M
C D
D C
*.
b
```

YES. IT IS A M FRAME.

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THE STUDENT COMPLETES THE LAST FRAME OF THIS ILLUSTRATIVE LESSON AS INDICATED BY THE OPTION DONE. THE STUDENT NOW HAS THE OPTION TO CLOSE THE SESSION OR REQUEST ANOTHER LESSON.

FOLLOWING THE LISTING OF THE STUDENTS FRAME BY FRAME PREFORMANCE, THE PROGRAM SUMMARIZES AND PRINTS THE NUMBER OF RIGHT, WRONG, UNANTICIPATED AND TOTAL NUMBER OF RESPONSES
THE TOTAL NUMBER OF RIGHT RESPONSES IS:
*.
11

YES, 11 CORRECT RESPONSES.
THE TOTAL NUMBER OF UNANTICIPATED RESPONSES WAS:
*.
one
YES, ONLY ONE UNANTICIPATED.
THE TOTAL NUMBER OF WRONG RESPONSES IS 4. THE NUMBER OF UNANTICIPATED RESPONSES IS PART OF THIS TOTAL. THESE TWO CATEGORIES PLUS THE NUMBER OF RIGHT RESPONSES FORMS THE BASIS OF THE TOTAL RESPONSES.

THE TOTAL NUMBER OF RESPONSES THIS STUDENT MADE WAS:
*.
15
RIGHT--15
LESSON CONCLUDED-ENTER COMMAND

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OFF-LINE/ON-LINE PRINTOUTS OF TEST--OFLINE

The Off-Line printout of the test--OFLINE is presented first, followed by the On-Line printout obtained by executing the test vehicle.

The Off-Line printout indicates the content of the test, depicting the various error conditions and associated messages which were specified to occur. The On-Line printout indicates that all error conditions were corrected and the test regenerated in an "error free" condition.

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FRAME LISTING AND ASSOCIATED ERROR MESSAGES

```
FRAME    1.0  TYPE Q    LABEL START

G.2 TEXT
  1.0                    OFF-LINE LESSON BUILDING DEMONSTRATION?
  2.0  THE PURPOSE OF THIS DEMONSTRATION IS TO ILLUSTRATE SOME OF THE ERROR
  3.0  CONDITIONS AND WARNING MESSAGES WHICH MAY OCCUR WHEN BUILDING A
  4.0  LESSON USING THE OFF-LINE LESSON BUILDING MODE OF THE COTS.?


FRAME    2.0  TYPE Q    LABEL

G.2 TEXT
  1.0  THIS LESSON DECK WILL BE PROCESSED AND THE ERROR CONDITIONS INDICATED
  2.0  AS A COPY OF THE LESSON IS OUTPUT ON THE LINE PRINTER.  THE ERROR
  3.0  MESSAGE IS EASILY SPOTTED AS IT IS FOLLOWED BY SEVERAL *** (ASTERISKS)
  4.0  WHICH EXTEND BEYOND THE NORMAL TEXT BOUNDARIES (72 COLUMNS).?


FRAME    3.0  TYPE Q    LABEL

G.2 TEXT
  1.0  EACH CARD WITHIN THIS LESSON DECK WHICH CAUSES AN ERROR CONDITION TO
  2.0  OCCUR WILL BE MARKED WITH A NUMBER FOR IDENTIFICATION PURPOSES. THESE
  3.0  NUMBERS WILL BE SEQUENTIAL.?
  4.0  A SECOND DECK OF CARDS HAVE BEEN PREPARED WHICH CORRECTS A GIVEN ERROR


FRAME    4.0  TYPE Q    LABEL

G.2 TEXT
  1.0  CONDITION. THESE ERROR CORRECTION CARDS ARE ALSO CODED. EACH
  2.0  CARD WILL HAVE A NUMBER, WHICH MATCHES A NUMBER IN THE LESSON DECK,
  3.0  PLUS A LETTER.?


FRAME    5.0  TYPE Q    LABEL

G.2 TEXT
  1.0  FOR EXAMPLE:?
  2.0        ERROR CORRECTION CARD:  1A  REPLACES
  3.0        LESSON DECK CARD:       1?
  4.0        ERROR CORRECTION CARD:  4A  REPLACES
  5.0        LESSON DECK CARD:       4?
```


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```
FRAME    6.0  TYPE Q    LABEL

G.2 TEXT
  1.0  IF MORE THAN ONE ERROR CORRECTION CARD IS NEEDED TO CORRECT A SPECIFIC
  2.0  ERROR CONDITION, IT WILL BE INDICATED BY HAVING THE SAME NUMBER
  3.0  FOLLOWED BY A DIFFERENT LETTER.?
  4.0        (I.E., 6A AND 6B OR 10A, 10B, AND 10C).


FRAME    7.0  TYPE Q    LABEL ERROR1

G,2 TEXT
  1.0  THE FIRST ERROR CONDITION ILLUSTRATED WILL BE EXCEEDING FRAME
  2.0  CAPACITY, THE LEGAL LIMIT OF CHARACTERS WITHIN A FRAME IS 400.?
  3.0  THIS IS PROBABLY THE MOST COMMON ERROR AND REQUIRES THAT THE COURSE
  4.0  DESIGNER SPLIT THE CONTENTS OF THE FRAME INTO ONE OR MORE FRAMES. THIS
  5.0  CAN USUALLY BE DONE BY PUTTING GROUP 3 AND 4 INTO A SEPARATE FRAME.?


   FRAME  CAPACITY REACHED. REMAINING CARDS  REJECTED FRAME    7.0 ***********


FRAME    7.7  TYPE Q    LABEL

G.2 TEXT
  1.0  THE NEXT ERROR CONDITION WILL POINT OUT THAT THE PROGRAM WILL NOT
  2.0  TOLERATE DUPLICATE FRAME NUMBERS.?


   DUPLICATE FRAME NUMBERS WERE INPUT.  THE ENTIRE FRAME WAS REJECTED FRAME


FRAME    9.0  TYPE Q    LABEL

G.2 TEXT
  1.0  IN THE NEXT TWO FRAMES WE WILL ILLUSTRATE A FRAME NUMBER ERROR,
  2.0  FOLLOWED BY AN ILLEGAL FRAME TYPE.
024ABC   FRAME NUMBER ERROR **************************************************


   ILLEGAL FRAME TYPE = 'Q1' WAS INSERTED FOR FRAME  11.0 ********************


FRAME   11.0  TYPE Q1   LABEL ERROR4

G,2 TEXT
  1.0  AGAIN, BY REPLACING LESSON CARD LABELLED 4 WITH ERROR CORRECTION CARD
  2.0  4A, A PROPER FRAME TYPE--Q, M, OR C WAS INSERTED.?
  3.0  THE PROGRAM AUTOMATICALLY INSERTS A 'Q' TYPE FRAME WHICH MUST BE
  4.0  CHANGED IF A 'C' OR 'M' TYPE FRAME WAS WANTED.?
```


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```
   ILLEGAL DECISION STATEMENT FOR FRAME  12.0 ************************************

FRAME  12.0  TYPE D   LABEL ERROR5

G.2 CONDITIONS
  1.0  F:NOW LET'S ILLUSTRATE A DECISION FRAME ERROR. THE FOURTH LINE OF THIS
  2.0  F:'D' FRAME WILL BEGIN WITH SOMETHING OTHER THAN IF, AND, OR, ELSE,
  3.0  F:END, F:, B:, OR %:.?

FRAME  13.0  TYPE Q   LABEL

G.2 TEXT
  1.0  IF CARDS WITHIN A PARTICULAR GROUP BECOME INTERMINGLED WITH THE CARDS 1
  2.0  OF ANOTHER GROUP, THE PROGRAM OUTPUTS AN APPROPRIATE ERROR MESSAGE.   2


FRAME  13.5  TYPE Q   LABEL ERROR6

G.2 TEXT
  1.0  REORDER THE CARDS-NUMBER ON THE RIGHT TO CORRECT THE ERROR AND        3
  2.0  TYPE GO.                                                             4

G.4 ACTIONS
  1.0  A F:                                                                 6


   DUPLICATE FRAME NUMBERS WERE INPUT.  THE ENTIRE FRAME WAS REJECTED FRAME  13.5


FRAME  14.0  TYPE M   LABEL ERROR7

G.2 TEXT
  1.0  THIS CONDITION CAN ALSO OCCUR IF A BLANK CARD IS INADVERTENTLY PLACED
  2.0  BETWEEN THE CARDS WITHIN A GROUP OR BETWEEN GROUPS.

G.3 ANSWERS
  1.0  A+AFTER REMOVING THE NEXT CARD


   DUPLICATE FRAME NUMBERS WERE INPUT.  THE ENTIRE FRAME WAS REJECTED FRAME  14.0
```


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```
   ILLEGAL FRAME LABEL FOR FRAME  15.0 ****************************************

FRAME  15.0  TYPE Q   LABEL

G,2 TEXT
  1.0  THIS FRAME MUST HAVE THE LABEL CORRECTED. THE LABEL INSERTED WAS
  2.0  'GOTO' WHICH IS RESTRICTED FROM USE AS A LABEL BY CUTS AS ARE ALL
  3.0  COMMANDS/OPTIONS.?
  4.0  REPLACE THE LESSON CARD MARKED 8 WITH THE ERROR CORRECTION CARD 8A.?


   REDUNDANT: LABEL IN USE AT FRAME   1.0 FOR FRAME  16.0 ********************

FRAME  16.0  TYPE Q   LABEL

G,2 TEXT
  1.0  ANOTHER TYPE OF ERROR CONDITION WHICH CAN OCCUR IS INSERTING A
  2.0  DUPLICATE LABEL. THIS IS NOT ALLOWED BY CUTS SINCE THE PROGRAM WOULD
  3.0  NOT KNOW WHICH LABEL TO BRANCH OR GOTO IF REQUIRED.?
  4.0  THIS FRAME HAS THE SAME LABEL AS FRAME 1.00. REPLACE CARD 9 WITH
  5.0  CARD 9A.?


FRAME  17.0  TYPE M   LABEL

G,2 TEXT
  1.0  THE PROGRAM PERFORMS CERTAIN CHECKS CONCERNING THE THREE SERVICE
  2.0  FUNCTIONS.

G,3 ANSWERS
  1.0  A+PHONETIC
  2.0  B+ORDER
  3.0  C+KEYWORD

G,4 ACTIONS
  1.0  ABC F:


   SERVICE FUNCTION INPUT FOR M FRAME FRAME  18.0 ******************************
```


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```
FRAME  18.0  TYPE M   LABEL ERR10

G.2 TEXT
  1.0  A WARNING MESSAGE IS OUTPUT WHEN A SERVICE FUNCTION IS INSERTED WITHIN
  2.0  A MULTIPLE-CHOICE FRAME. WHEN THIS HAPPENS THE FRAME SHOULD BE EXAMINED
  3.0  TO DETERMINE IF THE FRAME TYPE SHOULD BE AN 'M' OR WHERE THE FUNCTION

G.3 ANSWERS
  1.0  0 KEYWORD ON
  2.0  A+WAS DESIRED.
  3.0  B REMOVE
  4.0  C CARD 10
  5.0  D TO CORRECT THE FRAME.

G.4 ACTIONS
  1.0  A F:
  2.0  BCO F:


   SERVICE FUNCTION REJECTED FOR FRAME  19.0 **********************************

FRAME  19.0  TYPE Q   LABEL ERR11

G.2 TEXT
  1.0  WHEN THE SERVICE FUNCTIONS ARE INSERTED WITHIN A 'Q' FRAME, CUTS CHECKS
  2.0  TO INSURE THAT THE FORMAT IS CORRECT.?
  3.0  THIS FRAME HAD-C KEYBOARD ON- INSERTED. REPLACE CARD 11 WITH CARD 11A.?
  4.0  TYPE GO TO CONTINUE.

G.3 ANSWERS
  1.0  A GO

G.4 ACTIONS
  1.0  A F:FINE
  2.0  -F:LET' GO.


FRAME  20.0  TYPE Q   LABEL

G.2 TEXT
  1.0  THE PROGRAM ALSO CHECKS THE SERVICE FUNCTION STATEMENT TO INSURE?
  2.0       IT STARTS WITH A NUMBER C-9,
  3.0       IF SET IS USED, OFFSET WITH BLANKS,
  4.0       IS ESTABLISHED AS ON OR CFF.?
```


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,FRAME  23.0  TYPE Q   LABEL

G.2 TEXT
  1.0  THE NEXT ERROR CONDITION WILL BE MENTIONED BUT NOT DEMONSTRATED.?
  2.0  THE MAXIMUN NUMBER OF FRAMES ALLOWED PER LESSON IS 300. IF THIS
  3.0  LIMIT IS EXCEEDED, COTS WILL INDICATE:?
  4.0  DIRECTORY TABLE IS FULL. REMAINING FRAMES ARE REJECTED.?


FRAME  24.0  TYPE Q   LABEL

G.2 TEXT
  1.0  THE FRAMES PREVIOUSLY GENERATED MUST BE DELETED OR ANOTHER LESSON DECK
  2.0  MUST BE ESTABLISHED. IF THE REJECTED FRAMES ARE DESIRED.?


FRAME  25.0  TYPE Q   LABEL END

G.2 TEXT
  1.0  THIS CONCLUDES THE OFF-LINE DEMONSTRATION OF ERROR CONDITIONS AND
  2.0  WARNING MESSAGES.?
  3.0  IF ALL CORRECTIVE ACTIONS WERE TAKEN, THIS LESSON SHOULD NOW BE FREE
  4.0  FROM ERRORS. TYPOS, EXCEPT THOSE CHECKED BY THE COTS, MUST BE
  5.0  CAUGHT BY THE COURSE DESIGNER.
```


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?get ofline ab
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OFF-LINE LESSON BUILDING DEMONSTRATION

THE PURPOSE OF THIS DEMONSTRATION IS TO ILLUSTRATE SOME OF THE EROR CONDITIONS AND WARNING MESSAGES WHICH MAY OCCUR WHEN BUILDING A LESSON USING THE OFF-LINE LESSON BUILDING MODE OF THE CDTS.

THIS LESSON DECK WILL BE PROCESSED AND THE EROR CONDITIONS INDICATED AS A COPY OF THE LESSON IS OUTPUT ON THE LINE PRINTER. THE ERROR MESSAGE IS EASILY SPOTTED AS IT IS FOLLOWED BY SEVERAL *** (ASTERISKS) WHICH EXTEND BEYOND THE NORMAL TEXT BOUNDARIES (72 COLUMNS).

EACH CARD WITHIN THIS LESSON DECK WHICH CAUSES AN ERROR CONDITION TO OCCUR WILL BE MARKED WITH A NUMBER FOR IDENTIFICATION PURPOSES. THESE NUMBERS WILL BE SEQUENTIAL.

A SECOND DECK OF CARDS HAVE BEN PREPARED WHICH CORRECTS A GIVEN ERROR CONDITION. THESE ERROR CORRECTION CARDS ARE ALSO CODED. EACH CARD WILL HAVE A NUMBER, WHICH MATCHES A NUMBER IN THE LESSON DECK, PLUS A LETTER.

FOR EXAMPLE:

ERROR CORRECTION CARD: 1A REPLACES
LESSON DECK CARD: 1

EROR CORECTION CARD: 4A REPLACES
LESSON DECK CARD: 4

IF MORE THAN ONE ERROR CORRECTION CARD IS NEDED TO CORRECT A SPECIFIC ERROR CONDITION, IT WILL BE INDICATED BY HAVING THE SAME NUMBER FOLLOWED BY A DIFFERENT LETTER.

(I.E., 6A AND 6B OR 1ØA, 1ØB, AND 1ØC).
THE FIRST ERROR CONDITION ILLUSTRATED WILL BE EXCEEDING FRAME CAPACITY. THE LEGAL LIMIT OF CHARACTERS WITHIN A FRAME IS 4ØØ.

THIS IS PROBABLY THE MOST COMMON ERROR AND REQUIRES THAT THE COURSE DESIGNER SPLIT THE CONTENTS OF THE FRAME INTO ONE OR MORE FRAMES. THIS CAN USUALLY BE DONE BY PUTTING GROUP 3 AND 4 INTO A SEPARATE FRAME.

THE PARTICULAR FRAME SHOULD BE EXAMINED TO SEE EXACTLY WHAT MUST BE DONE.

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THE LAST FOUR LINES SHOULD NOW BE IN FRAME 7.5 AFTER THE ERROR CORRECTION CARDS 1A AND 1B HAVE BEEN INSERTED.

THE NEXT ERROR CONDITION WILL POINT OUT THAT THE PROGRAM WILL NOT TOLERATE DUPLICATE FRAME NUMBERS.

THE DUPLICATE FRAME NUMBER ERROR (FRAME 6.Ø TWICE) SHOULD NOW BE CORRECTED AFTER ERROR CORRECTION CARD 2A IS INSERTED AND THIS FRAME SHOULD NOW BE FRAME 8.Ø.

IN THE NEXT TWO FRAMES WE WILL ILLUSTRATE A FRAME NUMBER ERROR, FOLLOWED BY AN ILLEGAL FRAME TYPE.
AFTER REPLACING LESSON CARD LABELLED 3 WITH ERROR CORRECTION CARD 3A, THE CORECT FRAME NUMBER--1Ø.Ø SHOULD BE ACCEPTED.

AGAIN, BY REPLACING LESSON CARD LABELLED 4 WITH ERROR CORECTION CARD 4A, A PROPER FRAME TYPE--Q, M, OR D WAS INSERTED.

THE PROGRAM AUTOMATICALLY INSERTS A 'Q' TYPE FRAME WHICH MUST BE CHANGED IF A 'D' OR 'M' TYPE FRAME WAS WANTED.

NOW LET'S ILLUSTRATE A DECISION FRAME ERROR. THE FOURTH LINE OF THIS 'D' FRAME WILL BEGIN WITH SOMETHING OTHER THAN IF, AND, OR, ELSE, END,

IF CARDS WITHIN A PARTICULAR GROUP BECOME INTERMINGLED WITH THE CARDS 1
OF ANOTHER GROUP, THE PROGRAM OUTPUTS AN APPROPRIATE ERROR MESSAGE. 2
REORDER THE CARDS-NUMBER ON THE RIGHT TO CORECT THE ERROR AND 3
TYPE GO. 4
*.
go
LET'S PROCED ANYWAY 7
THIS CONDITION CAN ALSO OCCUR IF A BLANK CARD IS INADVERTENTLY PLACED BETWEEN THE CARDS WITHIN A GROUP OR BETWEEN GROUPS.
A AFTER REMOVING THE NEXT CARD
B THE FRAME WILL
C SIMULATE A LEGAL
D MULTIPLE-CHOICE FRAME. INSERT A LETTER
*.
b
NOT SO
THIS FRAME MUST HAVE THE LABEL CORRECTED. THE LABEL INSERTED WAS 'GOTO' WHICH IS RESTRICTED FROM USE AS A LABEL BY CDTS AS ARE ALL COMMANDS/OPTIONS.

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REPLACE THE LESSON CARD MARKED 8 WITH THE ERROR CORRECTION CARD 8A.

ANOTHER TYPE OF ERROR CONDITION WHICH CAN OCCUR IS INSERTING A DUPLICATE LABEL. THIS IS NOT ALLOWED BY CDTS SINCE THE PROGRAM WOULD NOT KNOW WHICH LABEL TO BRANCH OR GOTO IF REQUIRED.

THIS FRAME HAS THE SAME LABEL AS FRAME 1.ØØ. REPLACE CARD 9 WITH CARD 9A.

THE PROGRAM PERFORMS CERTAIN CHECKS CONCERNING THE THREE SERVICE FUNCTIONS.
A PHONETIC
B ORDER
C KEYWORD
*.
c
GOOD
A WARNING MESSAGE IS OUTPUT WHEN A SERVICE FUNCTION IS INSERTED WITHIN A MULTIPLE-CHOICE FRAME. WHEN THIS HAPPENS THE FRAME SHOULD BE EXAMINED TO DETERMINE IF THE FRAME TYPE SHOULD BE AN 'M' OR WHERE THE FUNCTION A WAS DESIRED.
B REMOVE
C CARD 1Ø
D TO CORECT THE FRAME.
*.
a
VERY GOOD
WHEN THE SERVICE FUNCTIONS ARE INSERTED WITHIN A 'Q' FRAME, CDTS CHECKS TO INSURE THAT THE FORMAT IS CORRECT.

THIS FRAME HAD-Ø KEYBOARD ON- INSERTED. REPLACE CARD 11 WITH CARD 11A.

TYPE GO TO CONTINUE.
*.
go to
FINE
THE PROGRAM ALSO CHECKS THE SERVICE FUNCTION STATEMENT TO INSURE

IT STARTS WITH A NUMBER Ø-9,
IF SET IS USED, OFFSET WITH BLANKS,
IS ESTABLISHED AS ON OR OFF.

THE NEXT EROR CONDITION WILL BE MENTIONED BUT NOT DEMONSTRATED.

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THE MAXIMUN NUMBER OF FRAMES ALLOWED PER LESSON IS 3ØØ. IF THIS LIMIT IS EXCEEDED, CDTS WILL INDICATE:

DIRECTORY TABLE IS FULL. REMAINING FRAMES ARE REJECTED.

THE FRAMES PREVIOUSLY GENERATED MUST BE DELETED OR ANOTHER LESSON DECK MUST BE ESTABLISHED. IF THE REJECTED FRAMES ARE DESIRED.

THIS CONCLUDES THE OFF-LINE DEMONSTRATION OF ERROR CONDITIONS AND WARNING MESSAGES.

IF ALL CORRECTIVE ACTIONS WERE TAKEN, THIS LESSON SHOULD NOW BE FREE FROM ERRORS. TYPOS, EXCEPT THOSE CHECKED BY THE CDTS, MUST BE CAUGHT BY THE COURSE DESIGNER.
LESSON CONCLUDED-ENTER COMMAND

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SAMPLE TRAINEE RECORD

A trainee record was selected from the total number of trainee records processed after the first day of Formal Qualification Testing (16 June 1969).

This is a partial trainee record as the user did not complete the "lesson" DEMOØ1. The CDTS option GOTO was used three times as indicated by the printout. There were 28 responses required in this sequence with the user responding correctly to 21. Of the seven incorrect responses, four were anticipated by the course designer and included within the body of the frames, whereas three were processed as unanticipated.

This record of trainee performance reflects approximately one hour of on-line interaction.

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PREPARED 69 JUN 16

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INDIVIDUAL HISTORY

LESSON-NAME DEM001 TRAINEE NAME STEVENSON TR-ID 500361587

OPTION	FRAME	TYPE	ANSWER	RIGHT/WRONG
	001.0	Q		
	002.0	M	A	+
	003.0	Q		
	004.0	Q		
	005.0	Q		
	006.0	Q		
	007.0	Q	A	+
	008.0	Q		
	009.0	Q		
	010.0	M	B	+
	011.0	Q		
	012.0	Q		
	013.0	Q	-	-
	014.0	Q		
	015.0	Q		
	016.0	Q	A	+
	017.0	Q		
	018.0	Q		
	019.0	Q		
	020.0	M		
	021.0	M	B	-
	022.0	D		
	018.0	Q		
	019.0	Q		
	020.0	M		
	021.0	M	A	+
	024.0	Q		
	025.0	M	A	+
	049.0	Q		
	050.0	Q	A	+
	051.0	Q		
	052.0	Q		
	053.0	Q		
	054.0	Q		
	055.0	Q	-	-
	056.0	M	C	+
	057.0	Q	B	+
	058.0	Q	A	+
	059.0	Q		
	074.5	Q		
	075.0	Q		

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076.0	Q	A	+
077.0	Q		
078.0	Q	A	+
079.0	Q		
080.0	M	B	-
081.0	Q		
081.3	Q		

UNCLASSIFIED

PAGE 001

PREPARED 69 JUN 16

UNCLASSIFIED
INDIVIDUAL HISTORY

LESSON-NAME DEM001 TRAINEE NAME STEVENSON TR-ID 500361587

OPTION	FRAME	TYPE	ANSWER	RIGHT/WRONG
	081.6	M	B	-
	081.8	Q		
	082.0	Q		
	083.0	Q	A	+
	083.5	Q		
	084.0	Q		
	084.5	Q		
	085.0	Q		
	085.5	M	A	-
	086.0	Q		
	086.5	Q		
	087.0	Q		
	087.5	Q	A	+
	088.0	Q		
	088.5	Q		
	089.0	M		
	089.5	M	A	+
	090.0	Q	A	+
	090.5	Q		
	091.0	Q	A	+
	091.5	Q	A	+
	100.0	Q		
	101.0	Q		
	102.0	Q		
	103.0	Q		
	104.0	Q		
	105.0	Q		

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	106.0	Q	A	+
	107.0	Q		
	108.0	Q	-	-
	109.0	Q		
	110.0	Q		
	111.0	Q		
	111.5	Q		
	112.0	Q		
GOTO	113.0			
	113.0	Q	A	+
	114.0	D		
GOTO	115.0			
	113.0	Q	A	+
	114.0	D		
GOTO	116.0			

TOTAL NUMBER OF RIGHT RESPONSES 021
TOTAL NUMBER OF WRONG RESPONSES 007
TOTAL NUMBER OF UNANTICIPATED RESPONSES 003
TOTAL NUMBER OF RESPONSES 028

END PAGE 002

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13. ABSTRACT

This report describes a study concerned with the design, development and evaluation of an integrated Computer-Directed Training Subsystem (CDTS) for the Air Force Phase II Base Level System. The development and evaluation of a course to train computer operators of the Air Force Phase II Base Level System under CDTS control is also described. Detailed test results for validation of the computer operator course and Formal Qualification testing of the CDTS are presented. Conclusions and recommendations with respect to the current CDTS recommendations for additional capabilities and further implications are discussed.

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14. KEY WORDS	LINK A		LINK B		LINK C	
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Phase II						
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On-line interactive teaching						
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CDTS						
Computer Operator's Course						